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FERDINANDSEN (C.) & BUCHWALD (N. F.). **Nogle undersøgelser over tømmersvampe med særligt hensyn til deres fugtighedskrav.** [Some investigations on timber fungi with special reference to their moisture requirements.]—*Dansk Skovforen. Tidsskr.*, xxii, pp. 685–715, 2 diags., 1938.

A detailed, fully tabulated account is given of the writers' studies in Denmark on potato dextrose agar cultures of three wood-destroying fungi, viz., *Coniophora cerebella* [*C. puteana*], *Polyporus vaporarius* [*Poria vaporaria*], and *Merulius lacrymans* [*R.A.M.*, xvii, p. 640], with special reference to their moisture requirements, calculated by the standard wood block method.

Of the three fungi, *C. puteana* was found to require the highest water content in the substratum of spruce (*Picea abies*), the most extensive break-down of which occurred at a water content of 46 to 34 per cent. of the dry weight. *P. vaporaria* ceased growth on blocks with a water content of 32 to 20 per cent. and caused only slight disintegration in one sample at 62 to 46 per cent. *M. lacrymans*, on the other hand, proved to be capable of destroying blocks with a water content as low as 16 per cent. at an atmospheric humidity of 95 to 87 per cent.

The number of spores produced by a single fruit body of the dry rot fungus in a cellar at the Agricultural College, Copenhagen, was calculated to reach a minimum of 1,000,000,000,000.

From fragments of boarding, collected among building refuse in Copenhagen streets, the writers cultured *C. puteana* and *Paxillus acheruntius* [*P. panuoides*].

HUNT (G. M.) & GARRATT (G. A.). **Wood preservation.**—viii+457 pp., 93 figs., 10 graphs, 5 diags., New York & London, McGraw Hill Book Company, Inc., 1938. 30*s*.

In this valuable contribution to the knowledge of wood preservation the writers have attempted to summarize the essential facts contained in the vast mass of literature on the subject and to provide an easily accessible and orderly presentation of the fundamental principles involved in the industry. The book is divided into twelve chapters dealing with: I, the field of wood preservation, II and III, agencies of wood deterioration, IV, wood preservatives, V, preparation of material for treatment, VI, wood-preserving processes, VII, factors affecting penetration and absorption, VIII, economic aspects of preservative

treatment, IX, properties of treated wood, X, treating plant and equipment, XI, methods of protecting wood other than by standard preservative treatment, and XII, fire-retarding treatments. An appendix contains one of the earliest (1716) American wood-preserving patents on record, directions for the determination of preservative penetration and sapwood depth, a sample specification for preservative treatment of timber, and tabulated statistical data relating to material treated in the United States from 1909 to 1936.

Cook (H. T.). **Vegetable seed treatment experiments and practice in Virginia.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1937*, pp. 105–111, 1938.

This paper includes a condensed account of work on cabbage and spinach seed treatment already noticed in this Review from another source [*R.A.M.*, xvii, p. 219].

The author also states that preliminary tests with tomato seed indicated that copper oxychloride, zinc oxide, vasco 4 [ibid., xvii, p. 502], cuprous oxide [ibid., xvii, p. 406], and copper sulphate solution give desirable increases in stand in open seed beds. Increases in stand from the treatments of over 100 per cent. were not infrequent.

On the basis of the author's results and observations a vegetable seed treatment chart has been prepared for seedsmen and farmers. In this, the stronger treatments are recommended, as the author considers these desirable. For example, for tomato seed disinfection, soaking for seven minutes in a 1:2,000 solution of mercuric chloride is recommended, as against the usual recommendation of five minutes' soak in a 1:3,000 solution. Fungicidal dusting after the mercuric chloride treatment is also advised.

In conclusion, the suggestion is made that seedsmen should be required to show on the label the kind of treatment that has been applied to their seeds.

Nitsche (G.), Kosswig (W.), & Förster (H.). **Histologische und zytologische Veränderungen in kräuselkranken Rüben. (Vorläufige Mitteilung.)** [Histological and cytological changes in crinkle-diseased Beets. (Preliminary note.)]—*NachrBl. dtsch. PflSchDienst*, xviii, 4, pp. 32–34, 8 figs., 1938.

A comparative histological and cytological examination was made of the hypocotyls and root system of healthy and crinkle-diseased beets in Germany [*R.A.M.*, xv, p. 764], the material having previously been fixed in Flemming's chrome osmium acetic acid and stained with safranin, crystal violet, and orange G. The most conspicuous features of the diseased phloem parenchyma were cellular and nuclear hypertrophy with accompanying degeneration, which were detected in the cortex, endodermis, pericycle, and central cylinder. Among the pathological changes in the nuclei were sinuosity and disintegration of the membrane, coagulation and dissolution of the chromatin, vesicular swelling, and final complete degeneration of the nuclear content, of which the nucleole appears to constitute the most resistant element. Coinciding with the nuclear deterioration were plasmatic modifications and disorganization of the cell walls. It is hoped that these alterations

may serve as diagnostic criteria of crinkle, the development of the external symptoms of which, such as bleaching of the leaf veins and foliar distortion, may be delayed for periods of one to six months after the feeding of the insect vector (*Piesma quadratum*) on the plants.

BARATHON-MAZEN (G.). **Emploi du bore contre la maladie du cœur de la Betterave.** [The use of boron against Beetroot heart rot.]—*Vie agr. rur., 1938*, N.S., 4, pp. 158–161, 3 figs., 1938.

In the exceptionally dry summer of 1937 the writer undertook a series of experiments in Allier, France, to determine the effect on heart rot of beets [*R.A.M.*, xvii, p. 285] of a special fertilizer, P.E.C. (Courtois formula), containing 2 per cent. boric acid in addition to the usual ingredients (8–13–19). The percentages of infection and yields in three varieties were as follows: (1) Vauriac; ordinary fertilizer 40 per cent. heart rot, P.E.C. 3 per cent., yields 45,000 and 61,000 kg. per hect., respectively. (2) White semi-sugar Vilmorin; ordinary fertilizer 70 per cent. heart rot, P.E.C. 2 per cent., yields 39,000 and 60,000 kg., respectively. (3) Vilmorin's Red; ordinary fertilizer 80 per cent. heart rot, P.E.C. 2 per cent., yields 36,000 and 70,000 kg., respectively.

LEACH (L. D.) & DAVEY (A. E.). **Determining the sclerotial population of Sclerotium rolfsii by soil analysis and predicting losses of Sugar Beets on the basis of the analyses.**—*J. agric. Res.*, lvi, 8, pp. 619–631, 2 figs., 2 diags., 1938.

After washing soil samples collected from beet fields infected with *Sclerotium rolfsii* [*R.A.M.*, xvi, p. 227] through a series of three screens of 10, 20, and 40 meshes to the inch, respectively, the authors were able to recover sclerotia of the fungus from the residue, and by incubating these at 30° C. on the surface of unsterilized peat soil in Petri dishes, they were able to determine with reasonable accuracy the number of viable sclerotia present in the field soils. It was found that in the sugar beet fields approximately 80 per cent. of the sclerotia occur in the upper 6 in. of soil, and less than 2 per cent. are more than 12 in. deep. For the determination of the populations of sclerotia they took soil samples to a depth of 8 in. in undisturbed soils; the number of viable sclerotia per square foot of soil to the depth of 8 in. was then calculated by methods which are described. Observations were made of the fluctuations in the sclerotial population in permanently marked areas within 17 commercial fields over periods of from two to five years. The results indicated a relatively high correlation between the number of viable sclerotia, determined before planting, and the percentage of infected sugar beets in the same area, and that the number of sclerotia in the soil increased in proportion to the percentage of infection. Sowing infected fields to non-susceptible crops such as wheat or barley, or to winter crops such as peas, resulted in a rapid reduction of the sclerotial population. Susceptible crops, such as beans, when abundantly irrigated during the summer months, usually maintained the sclerotial populations at a moderately high level. Soil analyses from fields subsequently sown to sugar beets showed that fields with over 200 viable sclerotia per sq. ft. invariably showed over 15 per cent. loss of sugar beets, while those with less than 100 sclerotia per sq. ft. usually

showed less than 10 per cent. loss. It is considered that this method may be useful in allowing severely infected soils to be avoided before sowing sugar beets.

CROSIER (W.) & PATRICK (S.). **The value of chemical seed treatments in germination studies.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1937*, pp. 117–121, 1938.

The authors point out that as the larger agricultural seeds generally used in chemical treatment tests are carriers of various micro-organisms which develop on dead or decadent seeds, it is necessary for a chemical to protect the seedlings as well as eliminate the micro-organisms. This was illustrated by a test in which duplicated rolls of 100 untreated pea seeds each gave 54, 70, 72, 67, and 72 per cent. germination, respectively. In every roll moulds were abundantly present and had penetrated to the adjacent rolls of treated seed. Seeds from the same samples treated by an instant dip in ethyl mercuric chloride were placed in contact with the untreated rolls, and the resulting percentages of germination were, respectively, 84, 92, 95, 85, and 78, i.e., increases of 6 to 30 (average 19·8) per cent.

The data obtained from tests with untreated pea seed and seed treated with new improved ceresan and mercuric chloride, applied as dips at a concentration of 0·15 per cent., the seeds being germinated in paper rolls at 20° C., showed that (1) the apparent number of normal sprouts in severely contaminated samples was increased by the treatments, (2) the germination of almost clean, strong seed is little affected by chemicals, (3) the treatments virtually eliminated fungal growths, (4) the treatments restricted bacteria to the point of origin of infection, but did not prevent bacterial soft rot of dead or decadent seeds, and (5) the treatments increased the total weight of the seedlings.

Experiments on pea seeds with a mixture made up of 20 parts copper stearate, 4 parts inert dust, and 1 part new improved ceresan gave very successful results in increasing apparent germination. Cuprous oxide, copper sulphate, and zinc oxide also eliminated the associated fungi. Onion seed treated with new improved ceresan dust germinated rather better than that treated with cuprous oxide dust but both methods gave more satisfactory results than treatment with the new improved ceresan dip. Cabbage, morning glory [*Ipomoea* sp.], sweet pea, salsify, cucumber, and muskmelon seeds were all benefited by dust and dip treatments, the mercury compounds increasing germination slightly more than the copper compounds, though both were very satisfactory.

CROSIER (W.). **The pathogenicity of Fusarium spp. in commercial Pea seed.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1937*, pp. 112–116, 1938.

In 1932, only 0·6 per cent. of the pea seed stock examined by the Association of Official Seed Analysts of North America was infected with species of *Fusarium* [cf. *R.A.M.*, xvi, p. 512; xvii, p. 431], the figures for the years from 1933 to 1937 being, respectively, nearly 7, about 2·2, 2·9, 1·1, and 1·4 per cent. Many of the infected seeds were surface-sterilized and placed on sterile agar, but *Fusarium* was isolated on every occasion, proving that these fungi establish themselves internally. Germination tests demonstrated the pathogenicity of these

organisms, the most injurious strains being found on stocks from the western United States. Peas, on the other hand, harvested in New York and Ontario contained 10 to 15 per cent. dead seeds infected with *Fusarium* spp., and *Rhizopus nigricans*, of which none of the former were pathogenic. These observations indicated that pathogenic species of *Fusarium* are seed-transmissible and common only to regions where wilt (*F. orthoceras* [var.] *pisi*) [ibid., xv, p. 339] is prevalent, though the symptoms caused by them are those of rotting, not wilt, whence it may perhaps be inferred that the wilt organism plays no part in the disease.

In experiments in 1937 on five varieties of peas grown in pots on sterilized soil and inoculated with cultures on wheat grains of *Fusarium* spp., *Alternaria* sp., bacteria, *Rhizoctonia* [*Corticium*] *solani*, and *Ascochyta pinodella* [ibid., xvii, p. 427] isolated from pea seeds, it was found that while a few of the strains were almost as injurious to pea seedlings as *C. solani*, some caused no significant decreases in stand; the average green weights of all the seedlings in the pots contaminated with *Fusarium* was 4·15 gm., as against 4·89 for the control seedlings. When a second lot of peas was sown in the same pots immediately after the conclusion of this test, it became obvious that only six of the *Fusarium* cultures depressed emergence. It appears certain that the *Fusarium* species common to pea seeds are not aggressive pathogens, that they do not cause wilt, and that they induce root rot or seed decay only when the mycelium is highly concentrated and free from other organisms.

DAVIS (G. N.). **Germination of treated and untreated Pea seeds in autoclaved and unautoclaved soil.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1937*, pp. 121–125, 1938.

In these experiments two lots of Alaska pea seed, one containing a high percentage of diseased seed and the other being almost free from disease, were germinated in autoclaved and unsterilized greenhouse compost at 20°, 15°, and 10° C., the seed being treated with either mercuric chloride 1 in 500, cuprocide [*R.A.M.*, xvi, p. 625; xvii, pp. 219, 540], copper oxychloride, formafume, ceresan, or 1 per cent. ethyl mercury phosphate, or left untreated as a control. The results obtained [which are tabulated] showed that the autoclaved compost consistently gave higher percentage germinations than the unsterilized, this applying both to the treated and untreated seed. All the seed treatments were beneficial in giving maximum germination of both lots of seed, especially in the unsterilized compost and at the lower temperatures. The best germination results were given by the ethyl mercury phosphate, ceresan, and cuprocide. The disease-free lot of seed in all cases consistently gave higher percentage germinations than the diseased lot, showing that it is very desirable for growers to use high quality seed.

GIGANTE (R.). **Il mosaico della Fava ('Vicia faba' L.) in Italia e comportamento di alcune Leguminose di fronte ad esso.** [Broad bean (*Vicia faba* L.) mosaic in Italy, and the reaction of some Leguminosae to it.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 4, pp. 497–529, 1 pl., 17 figs., 1937. [Received May, 1938.]

During 1937, broad beans (*Vicia faba*) growing in the vicinity of Rome were widely affected by mosaic [*R.A.M.*, xv, p. 28; xvii, p. 575],

the symptoms of which appeared to be identical with those described by Böning [ibid., vii, p. 134], and took both the form of marbling and of veinal mosaic, accompanied, especially in the case of the former, by curling and rolling. The affected plants were stunted, and gradually withered.

Artificial inoculations of healthy broad beans by rubbing the leaves with infected material and by the transference of juice from affected plants gave positive results in 16 per cent. of the tests. Inoculations of healthy peas with juice from affected broad beans gave 14 per cent. positive results [cf. ibid., xvii, p. 575], the symptoms set up being similar to those produced by pea virus 2 C [ibid., xvi, p. 583]. Inoculations of *Phaseolus vulgaris* leaves gave 100 per cent. positive results, the symptom patterns set up differing widely with the variety. The disease was also successfully transmitted to *Trifolium repens* and *Astragalus* sp. The author concludes that the disease is due to a virus complex.

EL-HELALY (A. F.). **A chocolate spot disease of Beans (Vicia faba). Part I.**—*Bull. Minist. Agric. Egypt* 191, 8 pp., 2 pl., 1 fig., 2 graphs, 1938.

Beans (*Vicia faba*) in the northern parts of Lower Egypt are very severely affected by chocolate spot, caused by *Botrytis fabae* [*R.A.M.*, xvi, p. 724; xvii, p. 15]. High atmospheric humidity favours the recurrence of the disease, the regional intensity of which increases with increasing rainfall. Laboratory studies showed that the fungus made best growth near P_H 4·5, the optimum temperature being about 20° C. The optimum temperature for germination of the conidia was about 21° and the thermal death point 51° (30 seconds' exposure), the corresponding figures for the formation and death of the sclerotia being near 20° and 51°. The conidia measure 14·5 to 29·1 by 11·3 to 19·4 (average 22·5 by 14·7) μ, and the sclerotia 0·6 to 3·8 by 0·4 to 3 by 0·8 (average 1·7 by 1·3 by 0·8) mm. [cf. ibid., ix, p. 424; xiv, p. 734]. The Egyptian, Spanish, and Cyprus strains of the fungus appear to be similar in all respects, except that the sclerotial measurements of the first differ slightly from the others.

MURPHY (D. M.) & PIERCE (W. H.). **A mosaic-resistant small red Bean.**—*Phytopathology*, xxviii, 4, pp. 270–273, 1938.

Excellent results in respect of resistance to common mosaic (bean virus 1) and curly top [*R.A.M.*, xvii, p. 90] have been obtained in Idaho with two selections, U.I. 3 and U.I. 34, of the Red Mexican bean [*Phaseolus vulgaris*] variety, both of which outyielded their parent in field tests in 1936 and 1937 (average yields per acre of U.I. 3, U.I. 34, and Red Mexican being 32·6, 33·3, and 23·9 lb., respectively), besides showing complete immunity from both diseases. Arrangements have been made for the release of stocks of the new beans to local growers.

NEWHALL (A. G.). **The spread of Onion mildew by wind-borne conidia of Peronospora destructor.**—*Phytopathology*, xxviii, 4, pp. 257–269, 4 figs., 1938.

In the summer of 1937, when abnormally wet conditions prevailed

in New York State, onion mildew (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xvii, p. 588] conidia were caught in the air over diseased fields to a height of 1,500 ft. Of 132 trapped on one 40-minute flight, 100 (75 per cent.) germinated. The conidia were experimentally shown to survive freezing in a block of ice (12 per cent. germination), seven hours' exposure to bright sunshine in drops of water (6·9 per cent. germination), and at least five days in the dark at a temperature of 9° C. and an atmospheric humidity of 70 per cent. A high proportion of the perennial topset and multiplier onions commonly found growing in farm gardens and in the small towns of agricultural counties showed mildew infection in June, and mycelium was detected in the bulbs in November. In some seasons, at any rate, these diseased perennial onions constitute a decided menace to the $2,000,000 commercial onion crop of the State, *P. schleideniana* having been shown by aerial dissemination tests to be wind-borne. Malachite green in dilutions up to 1 in 150,000 was found to be twice as toxic to the fungus as copper sulphate [ibid., xvii, p. 154].

Richardson (J. K.). **Studies on blackheart, soft rot, and tarnished plant bug injury of Celery.**—*Canad. J. Res.*, Sect. C, xvi, 4, pp. 182–193, 3 pl., 3 diags., 1938.

The author investigated the interrelationship of the various factors involved in the causation of black heart of celery [*R.A.M.*, xi, p. 279; xv, p. 777], primarily a physiological disorder attributed to unsuitable environmental conditions, and complicated by secondary infection by *Erwinia carotovora* and insect injury. The disease is stated to be very prevalent and destructive in certain market-gardening districts in Ontario. It occurs most extensively at the beginning of maturity, producing discoloration and water-soaking of the youngest heart leaves, followed by necrosis of the tips, margins, veins, or entire blades of the older leaves. Field observations, confirmed by greenhouse experiments, showed that the disease appeared during or after periods of high temperature or high humidity or both. The disease was most severe in vigorous plants and in early plantings. None of the celery varieties tested showed complete immunity from the disease, although Golden Plume and Golden Phenomenal showed considerable resistance. *E. carotovora*, associated with soft rot of celery, is stated to be a secondary invader of plant tissue affected with black heart, causing a soft, watery, light brown decay, which under moist conditions leads to rapid destruction of the plant. The tarnished plant bug (*Lygus pratensis*) causes considerable damage by spreading soft rot and destroying the fleshy stalks, leaf petioles, or in many cases the vascular tissue by toxic action during feeding, but has no relation to the primary black heart condition.

Price (W. C.) & Wyckoff (R. W. G.). **The ultracentrifugation of the proteins of Cucumber viruses 3 and 4.**—*Nature, Lond.*, cxli, 3572, pp. 685–686, 1 fig., 1938.

Purified solutions of Ainsworth's cucumber mosaic viruses 3 and 4 [*R.A.M.*, xiv, p. 554] were obtained after two quantity ultra-centrifugations, using saline for re-solution of precipitated protein and a period of centrifugation sufficient to sediment only a negligible amount

of the lighter component present in the juice of both healthy and diseased plants. Under the conditions obtaining in these experiments, the two heavy components were almost completely separated by applying a centrifugal field of 40,000 times gravity for not more than half an hour. The proteins of cucumber viruses 3 and 4 differ from unaltered tobacco mosaic virus protein in their virtual insolubility in pure water. Saline, however, dissolves them and facilitates the break-down of traces of the smaller high molecular weight substances.

The heavier components of the cucumber viruses are highly infectious and are no doubt essentially the same as the proteins of Bawden and Pirie [ibid., xvi, p. 346; xvii, pp. 564, 619]. As nearly as can be determined, the tobacco mosaic protein and those of the cucumber viruses sediment at the same rate and thus probably have the same molecular weights; their sedimentation constants are $s_{20} = 173 \times 10^{-13}$ cm. sec.$^{-1}$ dynes^{-1} and $s_{20} = 175 \times 10^{-13}$ for the cucumber viruses 3 and 4, respectively, compared with $s_{20} = 174 \times 10^{-13}$ for tobacco mosaic [ibid., xvii, p. 207]. The more rapidly sedimenting components ($s_{20} = 200 \times 10^{-13}$) detected in tobacco mosaic virus protein derived from plants infected for over four weeks were also found in the cucumber viruses.

Particular interest attaches to the presence in cucumber plants of a homogeneous high molecular weight substance distinct from the virus protein. Purified solutions from either healthy or diseased plants sediment with a single fairly sharp boundary corresponding to $s_{20} = 77 \times 10^{-13}$. They have given the usual qualitative tests for proteins and have constantly maintained a clear chlorophyll-green colour. Water solutions may be kept for several days in the ice-box, whereas in saline decomposition is more rapid. The repeated ultracentrifugation of saline solutions of purified cucumber mosaic and tobacco mosaic virus proteins denatured these substances and rendered them insoluble.

CAYLEY (DOROTHY M.). **Experimental spawn and Mushroom culture. II. Artificial composts.**—*Ann. appl. Biol.*, xxv, 2, pp. 322–340, 2 pl., 1938.

The author describes continued studies on artificial composts for the growth of mushrooms (*Psalliota campestris*, *P. arvensis*, and the wild haystack mushroom, an undetermined species of *Psalliota*) [*R.A.M.*, xvi, p. 725]. Artificial compost I, composed of two trusses of wheat straw, two trusses of hay (2 years old), one large sack of chopped straw, one large sack of chopped hay, 1 lb. sulphate of ammonia, 4 lb. slaked lime, and ½ lb. phosphate of potash, stacked in thin layers, damped, and left until the temperature rose to 110° to 120° F., then turned over four times and the bed cased with soil and lime after 3 to 4 weeks, gave better results in the open, where it produced a fair crop of several flushes 5 to 6 months after spawning. Artificial compost II, consisting of two sacks chopped straw, two sacks chopped hay, 6 oz. sulphate of ammonia, 2 lb. slaked lime, and ½ lb. phosphate of potash, turned over four times during 9 days, the temperature reaching 165°, and then made into beds, gave very unsatisfactory results except with one of the cultivated varieties, which produced a good clump of normal pilei 4 months after spawning. The wild grassland species (*P. campestris* and *P. arvensis*) failed to grow in any low temperature (90°) composts,

composed of the same ingredients as compost II; the wild haystack mushroom grew and fructified on a compost subjected to fermentation for one month but not longer, and the cultivated varieties grew well on composts subjected to fermentation for 1 to 2 months. In experiments with fermented composts, and with composts allowed to rot naturally without heat in the open, no growth occurred in composts made of 1 large sack chopped hay, 1 large sack of dried lawn mowings, 10 oz. sulphate of ammonia, some without lime and some with 4 oz. slaked lime, and an equal volume of soil when fermented to 160°, while the same mixture naturally rotted without heat produced normal pilei. The addition of garden soil reduced the alkalinity of both fermented and naturally rotted composts in most cases, with the exception of some fermented composts, where alkalinity was increased; it also reduced the temperature and induced early formation of strands. The experimental results indicate that the various composts, both fermented and naturally rotted, with and without lime, contain the necessary nutrients for the growth of the cultivated mushroom, provided that adequate aeration and friability are secured. Artificial heating would probably be necessary to obtain results comparable with those from horse manure.

MENDOZA (J. M.). **Philippine Mushrooms.**—*Philipp. J. Sci.*, lxv, 1–2, pp. 1–128, 79 pl. (13 col.), 5 figs., 1938.

In view of the increasing popularity of mushrooms as an article of diet in the Philippines and the widespread need for enlightenment concerning their properties, the author has prepared a copiously annotated list of the edible, poisonous, and other species of the numerous genera, including *Amanita*, *Lepiota*, *Collybia*, *Pleurotus*, *Clitocybe*, *Lentinus*, *Volvaria* (with *V. esculenta*) [*R.A.M.*, xvi, p. 660], *Psalliota*, and *Peziza*, in which the Islands abound. The taxonomic section of the paper is preceded by some introductory observations, a glossary, directions for the differentiation of mushrooms and toadstools, remarks on various physiological and morphological aspects of mushroom development, native names of mushrooms and superstitions concerning their relation to weather conditions, a summary of the available knowledge of mushroom toxicology, and notes on the importation of mushrooms into the Philippines, local methods of cultivation, and the possibilities of profitable commercial production, especially of *V. esculenta* and *Psalliota campestris*, the latter growing well under controlled temperature conditions on rice straw instead of manure [cf. preceding abstract].

STOREY (H. H.) & NICHOLS (R. F. W.). **A field experiment in the transmission of Cassava mosaic.**—*E. Afr. agric. J.*, iii, 6, pp. 446–449, 13 graphs, 1938.

In field experiments started in March, 1934, the authors investigated seasonal differences in the spread of the mosaic disease of cassava [*R.A.M.*, xvii, p. 371] and the susceptibility of plants in relation to their age. The experimental plots were situated at Kiwanda near Amani, where the mean monthly records over seven years show a fairly even rainfall throughout the year, rising to a peak in May and falling to

minima in January and July. At the beginning of each month during two years one healthy cassava plant of the Ubarika variety was planted in each of 48 9-plant square plots, which were surrounded by a hedge of mosaic-diseased cassava so that all experimental plants were exposed to a high and nearly equal rate of infection. All plants that had become infected were removed at the beginning of each month, and after 8 months from planting all surviving healthy plants, being now mature, were also removed, so that, had no infection occurred, each plot would have contained at any time after 8 months 8 plants from 1 to 8 months old. The results of both years were in close agreement and showed that plantings made in June survived, largely uninfected, for the longest time; May, July, and August were to a lesser degree also favourable planting months, while all plantings from December to April showed a high incidence of disease after three months' growth. After eight months' growth, however, almost all plantings were entirely diseased, the only survivals dating from May and June. The infections recorded during the second month of growth were significantly less than during any other month, owing, it is suggested, to their being the result of inoculations received between the middle of the first and the middle of the second month, when the cuttings had barely started to produce shoots and had not, therefore, been exposed to infection for the full period of a month. In plants over two months old the figures showed no significant relation between the age of the plant and its susceptibility. The probability of infection for plants in all age classes over two months varied largely with the season, being high from February to May (highest in March), falling rapidly after May, and remaining low from August to October. The advantage of June planting is thus again apparent, as the plants then pass the main period of their growth during months with the lowest probability of infection.

PACCA (D. W.). **Contribuição ao estudo das doenças da Mandioca.** [Contribution to the study of Cassava diseases.]—*Rodriguésia*, iii, 10, pp. 171–178, 8 figs., 1937. [Received June, 1938.]

The author states that, judging from the copious material sent in for examination from several States of Brazil from 1934 to 1936, the chief disease of cassava in the Republic is bacteriosis of the underground stems and roots, the main symptoms of which are internal discolorations and pronounced stunting, and in advanced cases rotting due to infection with secondary organisms such as *Diplodia* sp. and *Bacillus amylobacter*. Isolations from the margins of young infections yielded rods generally agreeing with *B. manihotus* Arthaud & Berthet, but differing from it in some cultural characters. So far artificial inoculations with the organism have not yielded positive results owing to some technical difficulties, but further work is in hand to determine its pathogenicity. During the spring of 1937 a small outbreak of rust was noticed in the experimental field of the Institute of Plant Biology, Rio de Janeiro, on several cassava varieties, the causal fungus of which agreed in the structure, colour, and size of its teleutospores with *Uromyces manihotis* Henn.; the author also found globose or elliptical, finely echinulate uredospores, 22 to 25 μ in diameter, with a pale yellowish epispore, 3 μ in thickness, and a thick, hyaline, occasionally

persistent pedicel; these spores are not described in Hennings's diagnosis. The rust attacked simultaneously the branches, buds, fruits, petioles, and new leaves of cassava plants, resulting in the development on these organs of more or less extensive hypertrophied or necrotic areas, and the production of witches' brooms. As a safeguard it is recommended that all diseased plants should be destroyed as soon as noticed. Some varieties in the field gave clear indications of being immune from the disease. A brief account is given of two leaf spots of minor importance, the first of which, however, caused by *Helminthosporium manihotis* Rangel, may be troublesome in thick cassava stands during warm, rainy seasons, and is fairly frequent in the Federal District; the other, due to *Cercospora caribaea* [*R.A.M.*, xv, p. 59] is only sporadic on certain varieties.

JENKINS (W. A.). **Two fungi causing leaf spot of Peanut.**—*J. agric. Res.*, lvi, 5, pp. 317–332, 1 pl., 5 figs., 1938.

A detailed account is given of the author's studies since 1934 of *Cercospora arachidicola* and *C. personata* [*R.A.M.*, xiii, p. 74], which are stated to cause serious defoliation of the varieties (especially the Spanish) of groundnut commonly grown in Georgia. In addition to conidia and spermogonia both fungi were found to produce perithecia, the genetic connexion of which with the conidial stages was established from the study of sectioned material and also by the fact that the symptoms obtained from the inoculation of healthy groundnut plants with ascospores were indistinguishable from those occurring in nature or resulting from inoculation with conidia. In neither species, however, were perithecia formed in pure cultures. On the basis of their morphological characters the two organisms are referred to the genus *Mycosphaerella* as *M. arachidicola* n.sp. and *M. berkeleyii* n.sp., respectively [with Latin diagnoses]. The first is characterized by scattered amphigenous, erumpent, ovate to nearly globose, black perithecia with a slightly papillate ostiole, 47·6 to 84 by 44·4 to 74 μ in diameter (and occurring mostly along the margins of the lesions); the asci are cylindrical-club-shaped, short stipitate, fasciculate, eight-spored, and 27 to 37·8 by 7 to 8·4 μ. The ascospores are uniseriate to imperfectly biseriate, two-celled, slightly curved, hyaline, and 7 to 15·4 by 3 to 4 μ (average 11·2 by 3·6 μ). The same description also applies to the ascogenous stage of the second, except for the size of the perithecia (84 to 140 by 70 to 112 μ), of the asci (30 to 40 by 4 to 6 μ), and of the ascospores (10·9 to 19·6 by 2·9 to 3·8 μ, average 14·9 by 3·4 μ).

In both species the formation of the perithecia is initiated in the autumn, simultaneously with that of the spermogonia, and additional evidence was obtained indicating that spermatia function as male sexual elements in the production of perithecia.

WOLLENWEBER (H. W.). **Fusariosen des Katjangs, Cajanus indicus.** [Fusarioses of Pigeon Pea, *Cajanus indicus*.]—*Arb. biol. Anst. (Reichsanst.), Berl.*, xxii, 3, pp. 339–347, 2 figs., 1938.

An expanded Latin diagnosis is given of *Fusarium lateritium* Nees var. *uncinatum* Wr. 1930 (syn. *F. uncinatum* Wr. 1917), held in pure culture since its original isolation from pigeon pea (*Cajanus indicus*)

[*C. cajan*] in India by E. J. Butler in 1905 and successfully inoculated into seedlings of the same host (70 per cent. infection) and reisolated from the diseased tissues in recent experiments at the Biological Institute, Berlin-Dahlem. The best results were obtained by the admixture with the pot soil of a minute quantity of ground mycelium from a barley groats culture. The affected plants developed a brown rot of the rootstock and stem base. This form of pigeon pea fusariosis and the wilt caused by *F. udum* [*R.A.M.*, x, p. 775] Butl. non Berk. differ from those associated with the plurivorous *F. anguioides*, *F. solani* and its var. *striatum*, *F. vasinfectum* [ibid., xvi, p. 151], and *Neocosmospora vasinfecta* [ibid., xiv, p. 144] in being restricted, so far as is definitely established, to the one host. The pigeon pea crop in India is therefore subject to two forms of fusariosis, of which the wilt due to *F. udum* appears to be of greater importance than the foot rot caused by *F. lateritium* v. *uncinatum*. A similar dual form of *Fusarium* infection is manifested by a number of other economic plants.

Zillig (H.). **Die Praxis der Peronospora und Oidiumbekämpfung.** [*Peronospora* and *Oidium* control in practice.]—*Wein u. Rebe*, xx, 4, pp. 120–126, 1938.

Under the conditions normally prevailing at the Bernkastel-Kues (Moselle) branch of the German Biological Institute, three applications of ¾ to 1½ per cent. Bordeaux mixture are sufficient for the control of *Peronospora* [*Plasmopara viticola*] on the widely grown Riesling vine variety—the first to coincide with the initial outbreak of infection as forecast by means of Müller's incubation calendar [*R.A.M.*, xvii, p. 292], the second (and most important) after flowering, when 90 per cent. of the corollas have fallen and the fruits are beginning to set, and third during the last ten days of July or early in August. In the case of the susceptible Gutedel and Müller-Thurgau varieties a preliminary treatment before the first expected outbreak of infection is advisable. In nurseries it is necessary to take special precautions, anticipating the development of the fungus by spraying the leaves immediately on unfolding with ¾ per cent. copper oxychloride and repeating the treatment at 10-day intervals, which must subsequently be reduced to 8 and in July and August to 5 days. The burying of debris before the renewal of spring growth is of the utmost importance both in the nursery and vineyard.

Two applications of sulphur dust, one during the latter half of May and a second immediately after flowering, are adequate in normal years for the control of *Oidium* [*Uncinula necator*: see next abstract].

Peglion (V.). **La lotta contro l'oidio della Vite.** [The campaign against the Vine *Oidium*.]—*Ital. agric.*, lxxv, 1, pp. 3–6, 1938.

In connexion with a general account of the life-history of *Oidium* of the vine [*Uncinula necator*] and the ecological conditions favouring its development, the writer mentions that in Italy the Trebbiani, Sangioveto, Luglienga, and Moscati varieties are particularly susceptible. Three applications of sulphur should be given: the first when the shoots have attained a length of 10 to 12 cm., the second at flowering, and the third when the grapes are turning black.

Marsais (P.) & Ségal (L.). **Contribution à l'étude de l'action anti-cryptogamique du cuivre.** [A contribution to the study of the fungicidal action of copper.]—*Rev. Vitic., Paris*, lxxxviii, 2286, pp. 285–287; 2287, pp. 305–311; 2288, pp. 325–327, 1938.

After an introductory section briefly indicating the factors that affect the control of vine mildew (*Plasmopara viticola*) by Bordeaux mixture, such as environmental and weather conditions, susceptibility of the host to infection, age of the leaf, and life-cycle of the fungus, the authors summarize and briefly discuss current views on the manner of action of the fungicide. In particular they discuss the amount of copper required for the toxic dose, whether the spore must be killed or germination merely prevented, chemical changes undergone by the mixture during the period of its retention on the leaf, and whether the toxic effect on the fungus is due to the cupric deposit being rendered soluble, to the penetration of the plant by the copper deposit, or to electrical phenomena. On the basis of this survey suggestions are made for a programme of research.

Emon (J.). **Court-noué et Phylloxéra.** [Court-noué and *Phylloxera*.]—*Rev. Vitic., Paris*, lxxxviii, 2287, pp. 303–305, 1938.

Observations made by the author during recent travels in the south of France and northern Italy showed that court-noué of the vine [*R.A.M.*, xvi, p. 366; xvii, pp. 222, 372] has become alarmingly prevalent in these localities, especially during the last two years. The disease causes most damage in young vineyards, where it is often overlooked until it is too late for remedial measures to be of use. In the author's opinion, *Phylloxera* [*vastatrix* f. *radicicola*] aggravates the disease by destroying the rootlets, and so increasing the rapidity of the invasion by court-noué [but cf. ibid., xvii, p. 222]. The 333 vine is attacked by court-noué in severe outbreaks, but Aestivalis and Monticola have so far shown resistance, though very susceptible to *Phylloxera*. The disease has appeared in soil not planted to vines for 15 years, and in other soil not previously planted to vines at all. Excessively deep trenching probably assists spread, and temperature may play some part. The remedy appears to lie in the selection of resistant stocks.

Laurent (P.). **Le pourridié de la Vigne.** [Root rot of the Vine.]—*Rev. Vitic., Paris*, lxxxviii, 2279, pp. 159–165, 6 figs., 1938.

The author states that two fungi, *Rosellinia necatrix* and much less commonly *Armillaria mellea*, are chiefly responsible for root rot of the vine in France, and gives a comparative description of the symptoms caused by them. While in heavy, wet soils root rot usually results in the relatively rapid death of the stock, on lighter and dry soils the lethal issue of the attack may be delayed for several years, the only macroscopic symptom being a yellow or brown discoloration of the woody tissues throughout the plant; in such cases the collapse of the diseased stocks may be sudden, and may be confused with apoplexy. All stocks affected by these fungi should be carefully removed with all their roots from the vineyards, and the soil under them disinfected with either carbon disulphide or formalin. Where newly broken land is suspected to be infected with either or both of the fungi, it should be disinfected previous to planting to vines, or be sown for several years with a crop

resistant to the pathogens. Infection may be introduced with rooted vine cuttings from infected nurseries.

MARCHAL (E.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1937.** [Observations and researches carried out at the State Phytopathological Station during the year 1937.]—*Bull. Inst. agron. Gembloux*, vii, 2, pp. 134–142, 1938. [Flemish, German, and English summaries.]

This report [cf. *R.A.M.*, xvi, p. 728] contains, among others, the following items of phytopathological interest. The Jubilé wheat variety (developed at Gembloux) continues to show resistance to *Ustilago nuda tritici* [*U. tritici*]. Straib's hereditary foliar necrosis [ibid., xv, p. 352] appeared regularly on certain varieties of wheat.

Marssonina graminicola [*Rhynchosporium secalis*: ibid., xvii, p. 22] was observed early in April seriously affecting winter barley, even the upper leaves of which showed characteristic spotting.

Potatoes, particularly of the Industrie variety, showed foliar necrosis due to Bawden's D virus [ibid., xvi, p. 704], the symptoms consisting of brownish or necrosed, localized, interveinal spots.

Flax showed an exceptional degree of infection by *Olpidiaster* [*Asterocystis*] *radicis* [ibid., xiv, p. 362], but was not seriously affected by any other disease.

Other records include *Heterosporium allii* on leeks [ibid., xi, p. 423; xvi, p. 773]; *Septoria phlogis* on phlox [ibid., xvii, p. 113] (a new record for Belgium); *S. chrysanthemella* on chrysanthemums [ibid., xvii, p. 181]; *Corticium vagum* [*C. solani*] causing a slow wilt, beginning as a discoloration and browning of the leaves, of *Araucaria*, which assumed epidemic proportions in some cases; *Thielavia basicola* forming superficial black crusts (with no apparent after-effect) on *Gloxinia*; severe and widespread infection of cherries by *Ascospora beyerinckii* [*Clasterosporium carpophilum*: ibid., xvi, p. 388]; *Gnomonia leptostyla* on walnut [ibid., xvi, p. 840] (more prevalent than usual); and the following on Canadian poplar [*Populus canadensis*]: canker (*Nectria galligena*) [cf. ibid., xiv, p. 478], *Didymosphaeria populina* [ibid., xi, p. 137], *Dothichiza populea* [ibid., xvii, p. 569], and a tracheomycosis caused by a species of *Cytospora*.

NEERGAARD (P.) **Aarsberetning fra J. E. Ohlsens Enkes plante-patologiske Laboratorium 1 April 1937–31 Marts 1938.** [Annual report of the phytopathological laboratory of J. E. Ohlsen's widow from 1st April, 1937 to 31 March, 1938.]—12 pp., 1 fig., 1938. [English and Esperanto summaries.]

During the period under review the following fungi were detected among the 2,760 samples of horticultural seed inspected at the above-mentioned Copenhagen seed-grower's phytopathological laboratory [cf. *R.A.M.*, xvii, p. 96]. *Alternaria porri* (Ell.) n. comb. (= *Macrosporium porri*) was found contaminating Zittau yellow onion seeds [ibid., xi, p. 224] and was inoculated through the soil into Silver-White Dutch leek seedlings with positive results. Hazel nuts (*Corylus avellana*) were infected by *Macrophoma corylina*. Both these records are new for Denmark, while the following hosts were attacked for the first time

by fungi already recorded: *Papaver alpinum*, *P. nudicaule*, and *P. umbrosum* seeds by *Helminthosporium papaveris* [ibid., xvii, p. 96], the two first-named, *P. glaucum*, *P. orientale*, and *P. paeoniflorum* by *Phoma rhoeadis*, and *Nemophila insignis* and *N. atomaria* by *P. nemophilae* [see below, p. 703], which causes typical damping-off of the seedlings and a virulent wet rot of the stems and leaves of older plants under warm, humid conditions.

SĂVULESCU (T.), ARONESCU (A.), SANDU-VILLE (C.), & ALEXANDRI (A. V.). **Starea fitosanitaria în România în anul 1935–1936.** [Phytosanitary conditions in Rumania during the year 1935–6.]—*Publ. Inst. Cerc. agron. României* 38, 70 pp., 6 figs., 1937. [Rumanian, with French translation. Received May, 1938.]

Following a summarized account of the relative incidence and severity of wheat rusts (*Puccinia triticina*, *P. graminis*, and *P. glumarum*) in the different wheat-growing centres of Rumania in 1935–6, a classification is given of the wheats tested during that year at two experimental Stations in the order of their resistance to all the three rusts together; at one Station three pure lines (American 15, Dalga 2 and 3) were found to be immune, and at the second 19 lines were classified as resistant. Wheat bunt (*Tilletia tritici* [*T. caries*] and *T. foetens*) was widespread throughout the country, and in some peasant holdings caused from 50 to 60 per cent. reduction in yield. The attacks were severe even in fields sown with seed-grain treated with disinfectant dusts, partly because of the dryness of the soil at autumn sowing, and partly owing to the inefficacy of certain preparations.

A virus disease of soy-beans is recorded characterized by curling of the leaves, and by brown or yellow mosaic, the last-named form being the most widespread. In varietal tests at two experimental Stations, for resistance to yellow mosaic, the variety Ossyeck was placed in class I at one Station and in II at the other.

Pseudomonas [*Bacterium*] *malvacearum* [*R.A.M.*, xvii, pp. 392, 439, 521] was again recorded on cotton in the country. Experiments at the Rumanian Institute for Agricultural Research indicated that cotton varieties with pubescent stems and leaves are in general more susceptible to the disease than the glabrous; the most resistant variety was Batonta, originating in Greece, the only drawback of which is that it is too late maturing for Rumanian conditions. It was also observed that cotton, grown in units of two rows alternating with two rows of maize in the field, was less attacked by *Bact. malvacearum* than in the absence of maize.

A brief historical outline is given of the appearance and development in Europe of *Puccinia antirrhini* on snapdragon [*Antirrhinum majus*], which was first recorded in Rumania in 1936 [ibid., xvi, p. 776] and appears to have gained ground in the country. Apart from the immediate destruction of all rust-diseased snapdragon plants, it is recommended that the plants be dusted with sulphur at the earliest appearance of the pustules.

Entyloma dahliae [ibid., xvi, p. 464] was first recorded on dahlias in Rumania in 1936 and is believed to have been introduced with earth-covered roots from abroad some four years before. Observations in the gardens of the Royal Castle at Bran indicated that the leaf spot caused

by the fungus is most severe in damp and shady spots; potash fertilizers increased the resistance of dahlias to the disease, but not superphosphate or calcium cyanamide; soil deficiency in lime predisposed even resistant varieties to the disease. When working over the soil of diseased dahlia beds, care should be taken not to dig in the fallen leaves, since the chlamydospores carried by them may remain viable for several years, and may start fresh infections when the soil is again worked over with a spade, bringing the remnants of the old leaves to the surface. Further observations showed that in general, Rumanian varieties and *Dahlia nana* varieties are the most resistant to the disease; of 62 varieties tested 17 were shown to be resistant, 8 slightly susceptible, and 37 susceptible.

Fireblight of apples (attributed to *Bacillus amylovorus*) [*Erwinia amylovora*] is reported from Bukovina [unsupported by bacteriological evidence], and exanthema was observed on hothouse lemons [ibid., xvi, p. 451].

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlix, 5, pp. 256–260, 5 figs., 1938.

In these notes it is stated that control of *Gibberella saubinetii* on maize depends essentially on the prompt destruction of the old stalks by burning (after cutting them out with a hoe and raking them together) and the adoption of crop rotation, but the selection of seeds free from infection is advocated as a precautionary measure. In the control of bean [*Phaseolus vulgaris*] anthracnose, *Colletotrichum lindemuthianum* [ibid., xvii, pp. 369, 574], the planting of resistant varieties is advocated, above all the Tweed Wonder variety, which was originally selected from a crop of Canadian Wonder beans and is resistant to all strains of the fungus present in New South Wales. The following measures of control are recommended against beet leaf spot, caused by *Cercospora beticola* [ibid., xvii, pp. 428, 440]: the use of clean seed, or disinfection of the seed with an organic mercury compound or with formaldehyde solution (15 in 1,000 for 7 minutes); planting in clean soil (seed-beds may be sterilized with formaldehyde before sowing); wide spacing of the plants; spraying with Bordeaux mixture (1–1–12) at 10- to 14-day intervals; and plant sanitation and crop rotation, excluding plants of the beet family for two or three years. *Calendula* rust (*Puccinia calendulae*) and leaf spot (*Entyloma calendulae*) [ibid., xvi, p. 633] may be controlled by destroying all self-sown seedlings; using new soil or soil disinfected by heat or formalin for successive plantings; dusting the plants thoroughly, at the first sign of rust, with finely divided sulphur, or alternatively spraying with one of the available colloidal sulphurs; and by removing and burning all affected plants at the close of the season.

Plant diseases.—*Rep. Wis. agric. Exp. Sta. 1935–36* (*Bull.* 438), pp. 106–120, 7 figs., 1937. [Received April, 1938.]

This report [cf. *R.A.M.*, xv, p. 2] contains the following items of interest besides those already noticed from other sources. In trials conducted over two years at Antigo and Arnott, green manuring reduced potato scab [*Actinomyces scabies*] only inconsiderably, if at all, though it definitely increased yields [ibid., vi, p. 684 *et passim*]. The potato varieties White Rural, Russet Rural, and Russet Burbank were superior

to other common varieties in scab resistance tests [ibid., xvii, p. 483], and several of the tested varieties, which were for other reasons of little or no practical value, were even more resistant than Russet Burbank and may be found suitable for parent stock in breeding scab-resistant varieties.

R. G. Shands found that *Gibberella saubinetii* survived eight months after harvest in 92 per cent. of kernels of scabbed barley [ibid., xvi, p. 805] grown during 1930; it survived 13 months in 57 per cent., 16 months in 24 per cent., 18 months in 8 per cent., and 27 months in 0·5 per cent. of the kernels and lost its viability completely 30 months after harvest. Similar results were obtained with barley grown in 1931. Of other fungi present on the barley *Alternaria* was apparently dead after 63 months, and species of *Helminthosporium*, causing head blight, were dead after 51 months. Scabbed barley fed to hogs 56 months after harvest and 26 months after the scab fungus had lost its viability still caused vomiting; diseased grain should preferably be fed to cattle, sheep, or poultry, but if it must be given to hogs the scabbed barley should be mixed with other feeds and not exceed 10 per cent. of the ration. Scab was found to injure the malting quality of barley by affecting germination, vigour of growth, and chemical composition of the grain, and fungus growth during the malting process caused discoloration of the malt.

J. C. Walker, O. C. Whipple, and V. Wright found *Septoria* leaf blight [*S. lycopersici*] to be the most destructive tomato disease [ibid., xvii, p. 217] in Wisconsin, causing almost complete late-season defoliation of the plants in about 90 per cent. of the affected fields. The source of infection was traced in most cases back to the seed and transplant beds. The control measures recommended include disinfection of all flats and benches, use of new or sterilized soil, spraying the plants with Bordeaux mixture, cleaning the greenhouse, hot-beds, and transplant beds of all plant material after transplanting, and keeping them free from weeds during the summer.

J. C. Walker developed several lines of the Wisconsin All Seasons variety of cabbage completely resistant to yellows [*Fusarium conglutinans*: ibid., xvii, p. 218]. Cabbage mosaic [ibid., xvii, pp. 426, 574] is reported to have caused severe yield reductions when the infection occurred at an early stage of plant growth, while mild infection in the head stage interfered with seed development and caused high seed losses in the more susceptible varieties. The variety Marion Market appeared to be most severely affected by the disease. Of the 2,600 cabbage plants tested for resistance to club root [*Plasmodiophora brassicae*: ibid., xvii, p. 426], only three survived repeated tests and the offspring of these individuals will also be tested.

J. C. Walker, O. C. Whipple, and W. Virgin record the occurrence of tomato spotted wilt attacking peas [ibid., xvi, p. 134]. An unknown virus, designated virus No. 729, produced a streak disease of peas resembling that caused by spotted wilt but differing in certain details. This virus is transmitted by the peach aphid [*Myzus persicae*], and is possibly a strain of the common cucumber mosaic, producing almost identical symptoms on a large number of the same hosts, although the symptoms differ on tobacco. Another virus, No. 408, also causes a streak disease of peas, though less severe than the first two, from both of

which it differs in attacking beans, causing a severe mosaic; it is also believed to be a strain of cucumber mosaic.

The results of spraying tests, conducted by G. W. Keitt and J. B. Carpenter, showed that for the control of fireblight of apple [*Erwinia amylovora*: ibid., xvi, p. 391; xvii, p. 535] summer spraying alone is not sufficient, but that it will possibly prove valuable in combination with other measures. Only copper fungicides were effective, however, no plot sprayed with these being severely blighted, whereas trees sprayed with lime-sulphur were just as badly diseased as those unsprayed.

The inoculation of tomato plants with pathogenic crown gall [*Bacterium tumefaciens*] bacteria showed effects similar to those produced by the so-called plant hormones [cf. next page], e.g., bending down of leaf petioles (epinasty), formation of root initials and of roots, stimulation of the cambium, and suppression of abscission layer formation at the petiole bases, and of axillary bud development on decapitated plants [cf. ibid., xvi, p. 730]. The accumulated evidence indicates that a diffusible substance from a pathogenic crown gall can pass down a tomato stem and influence the point where a crown gall develops [ibid., xvii, p. 224] and that crown gall cultures may produce growth-stimulating materials from tryptophane [cf. ibid., xvi, p. 591].

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1936–37*, Part I, pp. 108–128, 2 figs., 1937. [Received June, 1938.]

Two newly distributed wilt [*Fusarium bulbigenum* var. *niveum*: *R.A.M.*, xvi, p. 439]-resistant varieties of watermelon, Improved Kleckley Sweet No. 6 and Improved Stone Mountain No. 5, are stated to have been widely grown in 1936 and to have given satisfactory results.

H. C. Murphy states that in nursery trials in 1936 at Ames and Kanawha the oat varieties Black Mesdag, Brunker, Markton, Victoria, Navarro, Fulghum, and *Avena strigosa* were uniformly resistant to all the 57 collections of smut [*Ustilago avenae* and *U. kolleri*: loc. cit.] from different Iowa counties; Bond developed 2·8 per cent. infection with one collection. In greenhouse tests Victoria × Richland (C.I. 3311) and *A. strigosa* (C.I. 1782) were resistant to all the collections, and Black Mesdag, Bond, Navarro, Red Rustproof, and Victoria were either completely or highly resistant; Fulghum and Markton were each susceptible to different single collections. A collection of a rare buff-coloured smut, obtained from field-grown oats in 1936, produced 100 per cent. infection on the varieties Black Diamond, Canadian, and Richland.

C. S. Reddy states that treatment of oat seeds nearly free from smut [*U. avenae* and *U. kolleri*] with new improved ceresan increased the yields in 1934 and 1935, but failed to do so in 1936.

According to I. E. Melhus commercial sweet potato varieties showed marked differences in their relative resistance to stem rot (*Fusarium oxysporum* f. 2 and *F. bulbigenum* var. *batatas*) [ibid., xvi, p. 440] in tests, in which disinfected slips, selected from apparently healthy hills, were inoculated with the organisms; the varieties Prolific, Maryland Golden, Muscatine No. 1, and Muscatine No. 2 were moderately resistant, while Yellow Jersey, Edris, Vineless, Nolte Porto Rico, and Muscatine No. 3 were very susceptible. Preliminary tests with inoculated plants

of these varieties indicated that treatment of the slips with a solution of 1 lb. improved semesan Bel in 15 gals. water at transplanting time was effective in controlling stem rot regardless of the susceptibility of the variety. The most resistant varieties, Prolific and Muscatine No. 1, showed an increase from slip treatment of 68·2 and 67 per cent., respectively, in their final stand; an average of 74·8 per cent. of the inoculated and treated plants survived, compared with only 29·8 per cent. for the untreated. Inoculated and treated plants showed an average increase of 72·5 per cent. over the inoculated and untreated in the final stand from slip treatment.

Melhus also gives an account of investigations of the physical, chemical, and biological properties of the bacteriophage of *Pseudomonas* [*Bacterium*] *tumefaciens* [ibid., xvii, p. 380], with a view to using it in the control of crown gall in fruit tree nurseries. It was shown that the bacteriophage may be maintained in culture in a medium consisting of 3 gm. beef extract, 2·5 gm. peptone, and 2·5 gm. sodium chloride in 1 l. water. Ten c.c. of the medium inoculated with 100,000,000 bacteria and 0·5 c.c. of filtrate from the bacteriophage culture gave the optimum phage production when incubated at 25° C. It was shown that the bacteriophage may be recovered from galls on tomato, marguerite [*Chrysanthemum frutescens*], and sugar beet; it was not recovered, however, from galls on castor bean [*Ricinus communis*], peach, and *Bryophyllum*, and was never obtained from healthy plants. When present in the tomato galls, it was also recoverable from the tomato stem up to a height of 15 in. above the gall. In tests with 15 strains of *Bact. tumefaciens*, the phage lysed all the highly and some of the medium virulent strains, but had no action on all the strains of low virulence and on some of those of medium virulence. Further tests showed that the phage was still active at a dilution to 1×10^{-11} and survived heating at 90° for 10 minutes. It lysed the bacteria at all the temperatures and P_H values allowing the growth of the bacteria, and retained its activity after keeping at 5° for 305 days in the absence of the susceptible organisms. It withstood rapid desiccation at temperatures under 60°, was not precipitated by acetic acid or ammonium sulphate, and was insoluble in alcohol, chloroform, ether, butyl alcohol, and acetone. It retained its activity after exposure to 70 per cent. alcohol for 6 hours, 95 per cent. alcohol for 1 hour, 1/40 phenol for 1 hour, 1/3,000 nitric acid for 1 hour, N/64 sodium hydroxide for 1 hour, and 1 per cent. hydrogen peroxide for 72 hours.

Harris (R. V.) & Pearse (H. L.). **The crown gall disease of nursery stocks. III. A progress report on experiments from 1929 to 1937 to determine the relative susceptibility of Malling Apple stocks and including the production of galls by synthetic growth substances.**—*Rep. E. Malling Res. Sta., 1937*, pp. 187–193, 1 pl., 1938.

In continuation of studies on crown gall (*Bacterium tumefaciens*) of apple, initiated in East Malling in 1929 [*R.A.M.*, xi, p. 47], various rootstock varieties were either inoculated with pure cultures of *Bact. tumefaciens* or treated with lanoline paste containing 2 per cent. indolebutyric acid [cf. ibid., xvii, p. 224]. Following inoculations with the bacterium the percentage of trees developing galls varied with the

variety of rootstock, Malling No. II being the most susceptible, No. VII almost equally so, No. I comparatively resistant, and No. XVI highly resistant, and with the date of inoculation, more galls being generally produced when the trees were inoculated after the dormant period. Inoculation with *Bact. tumefaciens* had a measurable stimulating effect on the growth of the host which was irrespective of the formation of galls but varied with the variety of rootstock and the date of inoculation, while parallel treatment with 2 per cent. indolebutyric acid resulted in the formation of galls of uniform size, irrespective of the variety of the stock and the date of application, and caused a significant depression in the growth of stock No. II, though it had no effect on Nos. VII and XVI. The variability of gall formation following inoculation with *Bact. tumefaciens* is probably explained by the failure of the organism to produce a gall-forming substance in the absence from the host of some inactive precursor substance A (possibly tryptophane [ibid., xvii, p. 448; and above, p. 658]) from which the active gall-forming substance B can be derived. It is suggested that the etiological factors affecting the growth of the host are distinct from those determining the initiation of a gall.

HILDEBRAND (E. M.). **Growth rates of phytopathogenic bacteria.**—*J. Bact.*, xxxv, 5, pp. 487–492, 1938.

The growth rates of seven strains of the fireblight organism, *Erwinia amylovora* [see above, p. 658], five from various parts of the United States and one each from Canada and New Zealand, were determined in nutrient broth at 30° C., and the generation time found to range from 71 to 94 minutes, with an average of 82 and a mean deviation between parent and progeny isolates of $-1 \pm 2{\cdot}8$ minutes. The species is thus considerably slower growing than *E. carotovora*, the generation times of which were found by M. M. Mason (*J. Bact.*, xxix, p. 103, 1935) to be 57 and 42 minutes on plain and glucose broth, respectively.

Of 11 species of *Phytomonas* studied from the same standpoint, only one, *P.* [*Pseudomonas*] *utiformica* [*R.A.M.*, xvi, p. 328], required less than an hour (55 to 59 minutes) for generation, *Phytomonas* [*Pseudomonas*] *syringae*, sometimes regarded as identical with the foregoing [ibid., xvi, p. 329; xvii, p. 578], coming next with 73 minutes. The generative velocity of *Phytomonas apii* [*Bacterium jaggeri*] [ibid., xiv, p. 143], *P.* [*Bact.*] *flaccumfaciens* [ibid., xiv, pp. 430, 565; xv, p. 399], and *P.* [*Bact.*] *tumefaciens* was found to range from 78 to 85 minutes, corresponding roughly with that of *E. amylovora*. The generation times of *P.* [*Bact.*] *phaseoli* [ibid., xvi, p. 590; xvii, pp. 297, 369], *P.* [*Bact.*] *pruni*, *P.* [*Aplanobacter*] *michiganense* [ibid., xvii, p. 376], and *P.* [*Bact.*] *rhizogenes* [ibid., xvii, p. 18] were in the neighbourhood of two hours, while an unnamed organism causing cane gall of black raspberry [*Rubus occidentalis*] made the slowest growth of all (2 hours 35 minutes).

While the use of special media (potato-glucose and potato-mannitol apparently influenced the generation time of certain bacteria to some extent, the observed differences may not be significant and are possibly open to another interpretation. In the case of a Virginian culture of *E. amylovora*, for instance, loss of pathogenicity to pear fruits coincided with a decrease of five minutes in the period required for generation.

These data point to a very close relationship between the slow

growing *Phytomonas* and *Pseudomonas*, whereas the position of *Erwinia* is less clearly defined.

HAVAS (L.). **L'action de la colchicine sur le développement du 'phytocarcinome' de la Tomate. Essai d'interprétation du mécanisme de l'action de la colchicine.** [The action of colchicin on the development of the 'phytocarcinoma' of the Tomato. An attempt to interpret the mechanism of the action of colchicin.]—*Bull. Ass. franç. Cancer*, xxvi, 6, pp. 635–662, 5 figs., 1 graph, 1937.

The administration of colchicin (1 in 10,000) to Kondine Red and Best of All tomato plants previously inoculated with the crown gall organism (*Bacterium tumefaciens*) at the Faculty of Medicine, University of Brussels, induced a noteworthy retrogression in the resultant tumours, presumably through the agency of specific stimulatory hormones [cf. *R.A.M.*, xv, p. 82].

OGILVIE (L.). **Cereal diseases in the Bristol Province.**—*Rep. agric. hort. Res. Sta. Bristol, 1937*, pp. 110–117, [1938].

Brief, popular notes are given on the symptoms and control of the chief diseases found on wheat, barley, and oats in the Bristol advisory province.

MÜLLER-KÖGLER (E.). **Untersuchungen über die Schwarzbeinigkeit des Getreides und den Wirtspflanzenkreis ihres Erregers (Ophiobolus graminis Sacc.).** [Studies on cereal blackleg and the host range of its agent (*Ophiobolus graminis* Sacc.).]—*Arb. biol. Anst. (Reichsanst.), Berl.*, xxii, 3, pp. 271–319, 13 figs., 1 graph, 1938.

Continuing his studies on the blackleg form of cereal root rot caused by *Ophiobolus graminis* [*R.A.M.*, xiv, p. 157; xvii, p. 592] in Germany, the writer ascertained by observations and experiments on plants in sterilized and unsterilized soil of various types that the fungus is practically innocuous to v. Lochow's yellow oats, causes little damage to Petkus rye, attacks Ackermann's Isaria barley severely, and is intensely pathogenic to Peragis wheat. The degree of resistance appears to be correlated to some extent with the nature of the endodermal cell walls and the formation of 'lignitubers' in the host roots [ibid., xi, p. 708], but neither chemical nor anatomical peculiarities could be found to explain the varying reaction of the four cereals to *O. graminis*. All the plants were more virulently infected in an inoculated sterilized sandy clay-sand mixture than in inoculated unsterilized soil, the milder symptoms in the latter being attributed to delay in the establishment of contact between the pathogen and the roots and the relatively slow and scanty growth of the fungus. Inoculated three-weeks-old wheat and barley plants were more severely attacked in sterilized compost than in a sterilized sandy clay-sand mixture, presumably due to the superior aeration in the former promoting fungal development, whereas in the case of rye the relationship was unaccountably reversed and oats sustained equally little injury in either soil type. At the age of 2½ months, however, the inoculated cereals were less heavily infected in the sterilized compost than in the sterilized sandy clay-sand mixture. The introduction into the sterilized sandy clay-sand mixture of

suspensions of compost and *Bacterium prodigiosum* substantially reduced the incidence of infection by *O. graminis*, but the bacterial inoculum caused damage to the wheat plants. The reinoculation of a sterilized Fehmarn [island off Schleswig-Holstein] soil with unsterilized soil restored to the former a measure of its natural protective action against blackleg.

Poor barley yields are believed to be more often due to infection by *O. graminis* than is commonly recognized, especially where the crop follows wheat. Generally speaking, the influence of the preceding crop in relation to blackleg is conditioned by the susceptibility of the roots to the destructive action of the mycelium, while barley is also an unsuitable previous crop owing to its adverse effect on the soil tilth. Stable manure for the control of the disease should only be applied in a well-rotted state, preferably to the crop preceding that requiring protection.

None of the 73 dicotyledonous plants examined for their reaction to *O. graminis* in the sterilized sandy clay-sand mixture was infected to any appreciable extent. They may be divided into four groups according to the nature of the injury caused by the parasite, namely, (1) characterized by complete absence of mycelium from the root system; (2) fungal growth practically restricted to the exterior of the root system; (3) the primary root cortex (mostly excluding the endodermis) offers no apparent resistance to rapid hyphal invasion, but with the formation of a pericyclic epidermis the primary cortex is sloughed off and the mycelium simultaneously disappears; and (4) the primary root cortex is deeply penetrated, but the attacks (mostly localized) are promptly repelled, presumably through the agency of defensive reactions. The formation of perithecia or their rudiments was observed on plants of the second (*Chrysanthemum segetum*), third (*Scleranthus annuus* and *Chenopodium album*), and fourth (*Convolvulus arvensis*) groups, and is thus apparently independent of the degree of fungal infestation of the roots. From these observations it would appear that none of the dicotyledons used in the tests plays an important part in the spread of blackleg in the field.

NEWTON (MARGARET). **The cereal rusts in Canada.**—*Emp. J. exp. Agric.*, vi, 22, pp. 125–140, 1 graph, 1938.

This is a general account of the cereal rusts (*Puccinia graminis*, *P. triticina*, *P. glumarum*, *P. coronata* [*P. lolii*], *P. anomala*, and *P. dispersa* [*P. secalina*]), of Canada, based on outstanding contributions of recent years, practically all of which have been noticed in this *Review*. The aspects discussed include the distribution and perpetuation of the rusts, the losses caused by them, the distribution and prevalence of the physiological races, the relation of the barberry to the distribution of the physiologic races, and rust resistant varieties.

In 1937 the Thatcher and Renown wheat varieties [*R.A.M.*, xvii, p. 101] yielded in many parts of Manitoba from 30 to 40 bush. per acre and graded No. 1 Northern, whereas the two commonly grown standard varieties, Marquis and Ceres, yielded in the same localities an average of about 12 bush. per acre; further, much of the grain yielded by Marquis and Ceres was so shrunken by stem [black] rust [*P. graminis*]

that it had to be placed in special grades owing to its light weight per bushel. During the past year an oat variety resistant to black rust, Vanguard, a selection developed at the Dominion Rust Research Laboratory from a cross between Banner and Hajira, was distributed in the prairie provinces. The introduction of these new varieties would appear to mark a new era in cereal-growing in western Canada.

HASSEBRAUK (K.). **Weitere Untersuchungen über Getreiderostbekämpfung mit chemischen Mitteln.** [Further investigations on cereal rust control by chemical means.]—*Phytopath. Z.*, xi, 1, pp. 14–46, 1938.

On the basis of results obtained in previous experiments [*R.A.M.*, xvi, p. 236], 16 organic substances of known constitution containing nitro groups or sulphur were tested in the greenhouse for their toxicity to *Puccinia triticina* and *P. glumarum* on Michigan Amber and Strube's Squarehead wheat, *P. graminis tritici* on the former variety, *P. simplex* [*P. anomala*] on Friedrichswerth Berg winter barley, *P. dispersa* [*P. secalina*] on Petkus rye, and *P. coronata* [*P. lolii*] on Beseler's white oats. The chemical compounds were strewn over the surface of the soil in pots a few days before planting seedlings inoculated with highly pathogenic races of the rusts. The only ones affording complete control were p-toluolsulfonamide and o-toluolsulfonamide, the latter especially exerting a powerful action even at minimal concentrations, e.g., 0·6 mg. per 100 sq. cm. in the case of *P. triticina*, the corresponding figure for the former being 30 mg. These compounds, however, are apt to cause severe injury to the plants, comparing unfavourably in this respect with the moderately effective picric acid. The action of p-toluolsulfonamide on a single race (C) of *P. triticina* on 25 wheat varieties was absolutely uniform. The admixture of humus with the soil, especially in the form of peat, greatly reduced and in certain cases entirely neutralized the toxicity to rusts of some of the more promising compounds.

Carbolineum and other tar-oil products may exercise a strong repressive influence on rust development, probably through the secretion of volatile substances directly inhibiting fungal growth, but their action is subject to unpredictable variations due to external conditions, and they have the further disadvantage of an unfavourable chemotherapeutical index.

Similar objections apply to borax, the rust-reducing action of which reported by Gigante [ibid., xv, p. 350] was confirmed by the writer's tests.

GASSNER (G.) & HASSEBRAUK (K.). **Untersuchungen über den Einfluss von Äther- und Chloroformnarkose auf das Rostverhalten junger Getreidepflanzen. Ein Beitrag zum Resistenzproblem.** [Investigations on the influence of ether and chloroform narcotization on the reaction to rust of young cereal plants. A contribution to the resistance problem.]—*Phytopath. Z.*, xi, 1, pp. 47–97, 1938.

A comprehensive, tabulated account is given of a series of experiments to determine the influence of ether and chloroform narcotization on the reaction of young wheat plants to *Puccinia triticina* races 14 and 53, *P. graminis* race 79, and *P. glumarum* race 9, and of oats to *P. coronata*

[*P. lolii*] race 59 and *P. glumarum* race 9 [cf. *R.A.M.*, xii, p. 45 and preceding and next abstracts].

The administration of ether was found to exert no definite effect on susceptibility, which was almost uniformly accentuated, on the other hand, by chloroform, e.g., at 0·5 c.c. per 25 l. Even highly resistant varieties subjected to this treatment contracted severe infection, involving profuse fructification of the rusts, while the completely immune type of reaction was altogether absent. These results differ from those of Volk [ibid., x, p. 479] and Minkevičius [ibid., xii, p. 45] who found that narcotization decreases susceptibility to rust. The discrepancy is explained by the fact that these authors interpret alterations in intensity of attack in susceptible varieties as an effect on their susceptibility, whereas reduction in intensity of attack should not be regarded as a change in susceptibility as long as the infection type remains the same. Chloroform narcotization further influenced the development and appearance of the test plants, which frequently showed abnormalities of growth and an intensely dark green coloration due to their increased chlorophyll content. Associated with the latter was an increase of nitrogen, the relation of which to susceptibility constitutes a general phytopathological problem [ibid., xv, p. 350 *et passim*].

According to Chester [ibid., xiii, p. 116], narcotization enhances susceptibility by depriving the host cells of their capacity to secrete substances toxic to the invading organism, but the results of the writers' observations do not bear out this hypothesis. Rust resistance appears to be connected primarily with the production of antibodies neutralizing the fungal toxins and protecting the host cells against their action. In plants with a high nitrogen content, the fungal toxins may be partially neutralized but the growth of the fungus may be stimulated notwithstanding, since the presence of nitrogen is favourable to its nutrition.

Gassner (G.) & Franke (W.). **Einige Versuche über die Beeinflussung des Stickstoffhaushaltes junger Weizenblätter durch den Kohlensäuregehalt der Luft.** [Some experiments on the influence of the carbon dioxide content of the atmosphere on the nitrogen metabolism of young Wheat leaves.]—*Phytopath. Z.*, xi, 1, pp. 98–105, 1 graph, 1938.

Investigations are reported on the influence of the carbon dioxide content of the atmosphere on the nitrogen metabolism of young wheat plants in relation to susceptibility to rust [*Puccinia* spp.: *R.A.M.*, viii, p. 555, xiii, p. 755]. It has been established by several authors that a correlation exists between the carbon dioxide supply to the leaves and their nitrogen content, and this has been confirmed by experiments described in this paper. Previous work has shown that an increase in the carbon dioxide supply resulted in an increased rust attack, which is explained by the increased nitrogen content, and in a final decrease in the rust infection, for which there are no parallel changes in the nitrogen content of the host. The host reactions accompanying this final decreased susceptibility in excessive concentrations of carbon dioxide are quite abnormal, involving suppression of all the intermediate stages of reaction between moderate susceptibility and resistance, and the appearance of white flecks. The phenomenon is entirely un-

connected with modifications in the normal reaction of the plants to infection and must be due to unknown factors not related to the nitrogen content of the leaves.

STRAIB (W.). **Las razas fisiologicas de Puccinia glumarum en Sudamerica y su comportamiento en la infección comparado con el de las formas europeas.** [The physiological races of *Puccinia glumarum* in South America, and their behaviour in infection as compared with that of European forms.]—*Arch. fitotec. Uruguay*, ii, pp. 217–233, 1937. [German and English summaries. Received June, 1938.]

An account is given of experiments carried out since 1935 at Brunswick, Germany, with collections of stripe [yellow] rust (*Puccinia glumarum*) received by air mail from Uruguay [*R.A.M.*, xi, pp. 226, 630] and from Chile and the Argentine [ibid., xvi, p. 372], the results of which showed that at least four different physiological races of the rust, designated as races 30, 37, 38, and 39, occur in South America. All the four races were represented in the collections from Chile; race 30 was found in those from the Argentine and Uruguay, and there was indirect evidence of the presence in the Argentine of race 37; the peculiar behaviour of certain of the wheat varieties tested indicated the presence in the Argentine of still another physiological race which, however, has not so far been isolated from the rust samples. These results are considered to indicate that yellow rust spread from Chile, where its presence was first established in 1919, to the Argentine and Uruguay, where its epidemic occurrence finds a partial explanation in the fact that susceptible wheat varieties are grown in these countries. The majority of German wheat varieties were found to be resistant to the South American races, but both the German and South American physiological races had essentially the same pathogenicity range on the South American wheat varieties. As far as determined, the South American races are specific to wheat, but were experimentally shown to be capable of infecting certain barley varieties and various wild grasses (*Elymus*, *Hordeum*, and *Agropyrum* spp.). The fact that the same order of relationship was established between the virulence of individual German and South American races is held to support the hypothesis that new yellow rust races arise through progressive mutation. The paper includes a list of wheat varieties which the author considers to be adapted for breeding for resistance to yellow rust.

HOLTON (C. S.). **A new pathogenically distinct race derived from a cross between Tilletia tritici and T. levis.**—*Phytopathology*, xxviii, 5, pp. 371–372, 1938.

The reticulate chlamydospores of the interspecific hybrid recently derived by crossing races T_9 of *Tilletia tritici* [*T. caries*] and L_8 of *T. levis* [*T. foetens*] [*R.A.M.*, xvii, p. 505] were inoculated into Hard Federation wheat seed-grain and caused a high percentage of infection. Both parents and F_2 chlamydospores of the hybrid, morphologically resembling the T_9 parent, were inoculated into Hybrid 128, Oro, and Hohenheimer seed-grain with the following results: the bunt hybrid produced 85, 46, and 16 per cent. infection respectively, on the three

varieties in the order named, the corresponding figures for T_9 being 82, 3, and 28, and for L_8 80, 83, and 0·8 respectively. The hybrid thus differs from its parents in attacking both Oro and Hohenheimer to an appreciable extent, while its morphological resemblance to *T. caries* and ability to attack Oro, resistant to all the races of this species hitherto described, are also regarded as significant. Hohenheimer, moreover, is highly resistant to all known races of *T. foetens* and no previously recorded race of either species has been able to infect both these varieties. It would seem, therefore, that a segregate possessing the morphological characters of one parent and certain pathogenic features of both has been derived from a cross between *T. caries* and *T. foetens*.

MARTIN (J. F.) & SPRAGUE (R.). **Relative effectiveness of controlling different physiologic races of bunt by seed disinfection.**—*J. Amer. Soc. Agron.*, xxx, 5, pp. 390–394, 1938.

A tabulated account is given of five years' experiments at two localities in Oregon to determine whether any of the twelve different physiologic races of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] known to exist in the Pacific North-West [see preceding abstract] are more amenable than others to control by seed-grain (Hybrid 128 and Goldcoin) disinfection by standard preparations. No consistent variations were observed in the relative efficacy of control of any of the races tested, such differences as were detected being greatest where control was poor. A positive relationship was established between the incidence of bunt in the untreated control rows and the efficacy of control by seed-grain disinfection. The best treatments were new improved ceresan, copper sulphate (1 lb. each of copper sulphate and common salt to 5 gals. water, followed by a lime bath), and formaldehyde (1 in 320).

NISIKADO (Y.) & HIRATA (K.). **On the specific gravity methods in grading the Wheat seeds, as a control-means for the seedling blight, caused by Gibberella saubinetii (Mont.) Sacc.**—*Ber. Ōhara Inst.*, viii, 2, pp. 125–145, 1 pl., 4 graphs, 1938.

With a view to the control of wheat seedling blight (*Gibberella saubinetii*) by seed selection, grains were harvested in 1937 from diseased and healthy heads of twelve varieties cultivated in southern Kyushu, Japan [*R.A.M.*, xiv, p. 296], and graded according to specific gravity, absolute weight, and diameter. The grains were first soaked in water and those rising to the surface (being below 1·00 in specific gravity) discarded, while the remainder were successively transferred to aqueous solutions of magnesium chloride with specific gravities of 1·00, 1·05, 1·10, 1·15, 1·20, and 1·24 and ultimately placed in six categories (excluding those below 1·00), viz., (1) specific gravity 1·00 to 1·05, (2) 1·05 to 1·10, (3) 1·10 to 1·15, (4) 1·15 to 1·20, (5) 1·20 to 1·24, and (6) above 1·24.

Germination tests were conducted on sand with a water content of about 50 per cent. of saturation, a temperature of 24° C. being maintained and counts made after 5, 8, and 10 days' incubation. The next step involved the surface sterilization of the grains, first in 50 per cent. alcohol and then in 0·1 per cent. mercuric chloride (2 minutes each), and their subsequent growth on a rice decoction agar medium with

the addition of various carbohydrates; the presence of colonies of *G. saubinetii* was revealed by a red coloration of the medium.

It was found that the average infection (as manifested by the presence of internal hyphae) of twelve varieties for grains of specific gravity below 1·00, and the six other categories, was 29·0, 20·2, 13·0, 12·7, 7·6, 4·3, and 0·5 per cent., respectively, the percentages of wheat grains found in each of the classes being 20·7, 3·7, 4·9, 5·6, 8·0, 8·8, and 48·4, respectively. On the variety Hatakeda diseased grains were 20 to 25 mm. in diameter whereas the healthy were 25 to 27 mm. Grains with a specific gravity exceeding 1·24 germinated very satisfactorily—with an average percentage of over 91·6 per cent. for most of the varieties tested, while no internal hyphae of *G. saubinetii* were present, except in Hatakeda and Pusa No. 12. Grains with specific gravity above 1·20, even when originating on blighted heads, may safely be sown as seed for the next generation, but surface sterilization should be practised in order to eliminate possible external contamination by the hyphae or spores of the fungus.

Gassner (G.) & Kirchhoff (H.). **Einige abschliessende Versuche über die Wirkung der Warmbenetzungsbeize.** [Some final experiments on the effect of the hot-water moistening method of disinfection.]—*Phytopath. Z.*, xi, 2, pp. 115–120, 1938.

In this final contribution to their studies on the hot-water moistening method of grain disinfection for the control of loose smut of wheat and barley [*Ustilago tritici* and *U. nuda*: *R.A.M.*, xv, p. 787] the authors describe a few unpublished experiments on the effect of different steeping and presoaking periods, the results of which are in full agreement with previous data, and sum up the conclusions arrived at as follows: the amount of fluid per 50 kg. of grain must be not less than 6 l.; the addition of 1 per cent. methylated spirit ensures the fungicidal effect without impairing the germination; the period of presoaking should be either 4 hours at 20° C. or 7 to 8 hours at 10°; and the treatment itself should occupy one hour at 54° to 55°.

Tapke (V. F.). **Influence of environment, after seedling emergence, on covered smut in Barley.**—*Phytopathology*, xxviii, 5, pp. 370–371, 1938.

The following results were obtained in October, 1936, at Arlington, Virginia, in experiments with formaldehyde-treated seed-grain of Tennessee and Wisconsin Winter barleys inoculated with covered smut (*Ustilago hordei*) [*R.A.M.*, xvii, p. 308] by dusting with spores and also by the spore suspension method [ibid., xv, p. 210]. Field and greenhouse plants from the uninoculated (control) lot of seed were smut-free, those from the batch inoculated by the spore suspension method contracted a high incidence of infection (72 to 74·7 per cent.), while superficial dusting with spores produced different results according to the post-emergence treatment of the seedlings, those immediately placed outdoors contracting only 27·8 per cent. while those first subjected to greenhouse conditions for a fortnight or a month developed 55·1 and 65·3 per cent., respectively. Greenhouse plants from spore-dusted seed showed 63·9 per cent. infection.

It seems apparent from these results that the spore suspension method of inoculation, involving the lodging and germination of the spores beneath the hulls, enables the smut to become sufficiently entrenched within the host tissues to resist adverse post-emergence conditions, which may, however, well delay the penetration into the interior of the hyphae developing from spores superficially dusted over the seed. This may account for the discrepancy between the low field and high greenhouse incidence of covered smut obtained in spore-dusting inoculation tests on barley by J. A. Faris in 1924 [ibid., iv, p. 214].

GREANEY (F. J.), MACHACEK (J. E.), & JOHNSTON (C. L.). **Varietal resistance of Wheat and Oats to root rot caused by Fusarium culmorum and Helminthosporium sativum.**—*Sci. Agric.*, xviii, 9, pp. 500–523, 1 graph, 1938.

After briefly referring to their previous papers on the root rot problem of cereals in Canada (*Fusarium culmorum* and *Helminthosporium sativum*) [most of which have been noticed here: *R.A.M.*, xiv, p. 298; xvi, p. 307; *et passim*], the authors give a summarized account of tests from 1930 to 1936 of several standard varieties and a large number of rust-resistant selections of spring wheats, for resistance to root rot caused by both fungi, and of tests from 1934 to 1936 of ten standard varieties and rust-resistant strains of oats to root rot caused by *F. culmorum*. The tests were carried out in the Root Rot Garden of permanent, artificially infected plots at Winnipeg and in field trials under artificially induced and natural epidemics at different stations in Manitoba. It was found that the ability of the wheat seed-grain to produce young plants was highest in the wheat varieties and selections that were most resistant to root rot, and lowest in the most susceptible ones. All the standard varieties, as well as most of the rust-resistant wheats, proved to be markedly susceptible to root rot, though significant differences were apparent between varieties in their reaction to the disease. The variety Mindum and a few selections with Mindum parentage were most susceptible to root rot, while a few of the rust-resistant selections, particularly Apex and Thatcher, proved to be the most resistant. In general, it was established that in any given year the varieties susceptible to *F. culmorum* consistently retained their susceptibility independently of the wide range of field conditions under which they were grown, while the most resistant varieties consistently remained the most resistant. The latter varieties were also fairly consistently resistant to *H. sativum*, while susceptibility to either of these fungi was significantly associated with susceptibility to the other. The results of the tests with oat varieties showed that they varied significantly in their reaction to *F. culmorum*; Ohio and Victoria and the rust-resistant hybrid Hajira × Banner (Selection 13) were most resistant, while the standard varieties Victory and Banner were the most susceptible.

SOUKHOV [SOUKHOFF] (K. S.) & VOVK (A. M.). **Mosaic disease of Oats.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xix, 3, pp. 207–210, 2 figs., 1938.

The authors give an account of their investigations of the condition of oats described from Siberia under the name 'zakooklivanie' ['pupation': *R.A.M.*, xiv, p. 493], the results of which showed that the first symp-

tom of the disease to become apparent is the development of light green stripes and spots on the leaves and leaf sheaths; in 1937 this symptom appeared on the 18th day from sowing in oats sown both on the 5th and on the 29th July, indicating that probably the incubation period remains constant under different meteorological conditions. The other macroscopical symptoms [loc. cit.] develop much later, and are almost invariably accompanied by the mosaic pattern on the leaves and leaf sheaths; the latter symptom, however, has a tendency to become masked under the influence of dryness or high temperature of the air. Field observations indicated that diseased plants are very irregularly dispersed among the healthy, without the formation of any definite infection foci, and that the incidence and severity of the disease decrease considerably in the later sown oats. Cytological studies showed the presence of vacuolate bodies similar to those found in mosaic wheat [ibid., xvi, p. 665] and of spindle-shaped crystals, probably of protein nature, in the epidermal cells. Further studies revealed considerable disturbances in the vascular system of diseased oat plants, and considerable necrosis of the phloem of stunted plants, sometimes spreading to the neighbouring portions of the parenchyma. In slightly affected plants the phloem is not necrosed but is weakly developed. The total nitrogen content of stunted oat plants was found to be 2·7 to 3·03 per cent., as against 1·5 to 1·7 per cent. in healthy plants.

These investigations are held to have confirmed the view of previous workers that 'zakooklivanie' is due to a virus, and the fact that out of 3,773 oat plants grown under gauze cages only six developed the disease, presumably owing to the accidental intrusion of a carrier in two of the cages, would indicate that infection is not carried in the soil but is distributed by some as yet undetected insect.

All the varieties of *Avena sativa*, *A. strigosa*, and *A. byzantina* tested by the authors were found to be susceptible to the disease, which was also reported by another worker on *A. fatua* and *A. sterilis*.

Balks (R.) & Wehrmann (O.). **Magnesiamangelerscheinungen bei Feldversuchen zu Winterroggen auf leichtem Sandboden in Braunschweig.** [Magnesium deficiency symptoms in field experiments with Winter Rye on a light sandy soil in Brunswick.]—*Ernähr. Pfl.*, xxxiv, 9, pp. 145–147, 6 col. figs., 1938. [English and Spanish summaries on p. 164.]

In connexion with a fertilizing experiment on winter rye on a strongly acid (P_H 4·4) light sandy soil in Brunswick (Germany) in 1937, the plants deprived of magnesium contracted a disease characterized in the initial stages by localized accumulations of chlorophyll in the leaves, followed by the development of a yellowish to brownish mottling [cf. *R.A.M.*, xvii, p. 385] and a red discoloration of the leaf tips and margins, which tended to curl inwards. Plants transferred to pots at an early stage of the disorder and supplied with magnesium sulphate at the rate of 0·5 gm. per pot were cured in five days.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1936–37*, Part II, pp. 51–58, 1937. [Received June, 1938.]

I. E. Melhus and G. N. Davis give a brief account of an experiment

started in 1935 to determine whether the relation observed in maize between the development of axillary buds and the abundance of nodal infection with smut (*Ustilago zeae*) [*R.A.M.*, xiv, p. 750; xv, p. 712] also obtains in smuts on other Gramineae. The results showed that the removal of the mature heads from sorghum plants raised from seed heavily infected with covered kernel smut (*Sphacelotheca sorghi*) [ibid., xvii, pp. 16, 453], appeared to stimulate the development of axillary and adventitious buds in almost endless profusion, each new culm being potentially capable of producing one or more smutted heads. It was further found that the behaviour of *S. sorghi* in its host is apparently much the same as that of maize smut in the maize plant, inasmuch as occasional smut-free heads are produced on plants on which all the other heads are smutted, though it differs from the maize smut in that it is a true systemic smut.

I. E. Melhus reports further investigations on the development, nature, and action of the *Diplodia zeae* inhibitor (autotoxin) [ibid., xiv, p. 751], the results of which indicated that the responsible substance or substances belong to the complex amines or betaines, and are non-volatile. It was further demonstrated that the inhibitor was present in maize plant material seven days after artificial infection of the plants with *D. zeae*, and that it had a delaying action on the germination of *D. zeae* spores collected in the field.

C. S. Reddy states that further studies of the *Basisporium* dry rot of maize [ibid., xvi, p. 310] showed that in a year of high infection (1935) with the pathogen the small-spored species (*Nigrospora oryzae*) predominated, whereas in a year of low infection, such as 1936, the large-spored *N. sphaerica* was predominant. Almost complete domination of one species over the other occurred in those two years.

Larsh (H. W.). **Relative prevalence of Diplodia zeae and Diplodia macrospora on Corn.**—*Plant Dis. Reptr*, xxii, 9, pp. 159–162, 2 maps, 1938. [Mimeographed.]

Isolations from 200 apparently diseased kernels selected macroscopically from eleven samples of maize received in the United States in various shipments from the Argentine gave *Diplodia zeae* and *D. macrospora* [*R.A.M.*, xvi, p. 739; xvii, pp. 238, 452] in 45 and 2 instances, respectively. In random samples of diseased maize stalks collected in the field early in 1938 in Alabama, Florida, Georgia, South Carolina, and Tennessee the same two fungi occurred 653 and 15 times, respectively, and *D. frumenti* (*Physalospora rhodina*) 11 times. In 1930, Eddins [ibid., ix, p. 712] made similar observations on the relative frequency of these fungi in Florida, finding that out of 618 diseased maize stalks 496 showed the presence of *D. zeae*, 102 that of *D. macrospora*, and 20 that of *D. frumenti*. Cultures from diseased maize ears collected by the author at the same time as the stalks and from other samples received from North Carolina, Tennessee, and Louisiana gave *D. zeae* and *D. macrospora* in 390 and 16 instances, respectively.

It is concluded that *D. zeae* is much more widely distributed than *D. macrospora* in the United States and is much more commonly present than the latter wherever the two fungi are found.

MEIJERS (P. G.). **Einige waarnemingen over de Maisroest.** [Some observations on Maize rust.]—*Landbouwk. Tijdschr., Wageningen*, 1, 612, pp. 451–454, 1 diag., 1938. [German summary.]

In the course of a varietal experiment with seed maize at the State Agricultural Experiment Station, Noordlaren, Groningen, Holland, in 1937, an outbreak of rust (*Puccinia maydis*) [*R.A.M.*, xvii, p. 452] developed (for the first time in the locality) on the early North American variety Gehu and rapidly spread to a number of other early maturing sorts, e.g., Mecklenburg, Pomerania, Blanc des Landes, and Nano précoce Succi, while a selection of the Dutch Moorland Association, Giersdorf, Minnesota 23, Northwestern, and Précoce C.C. were relatively resistant, and the late ripening Précoce cinquantino F.S., Minnesota 13, and Yellow Baden Land remained free from infection.

KLOTZ (L. J.) & BASINGER (A. J.). **The influence of various types of rind injury on the incidence of water spot of Navel Oranges.**—*Bull. Dep. Agric. Calif.*, xxvii, 2, pp. 232–241, 2 figs., 1938.

In this paper the authors describe the experiments and give the data on which former conclusions, already noticed from another source [*R.A.M.*, xvii, p. 390], were founded. In experiments conducted in 1935 and 1937 Navel oranges were entirely immersed in tap water for 18 to 19 hours (or partially immersed for periods of up to 5 days, the exposed navel ends being covered with wet cloth) and subsequent examination showed that the presence of fresh wounds caused by thorn and twig punctures, sand, hail, wind, or resulting from frost or oil sprays increased the incidence of water spot, while the presence of old, healed scars due to *Thrips*, *Tortrix*, Katydids, rubs, scratches, and chemical burns had no effect. The occurrence of both insect scars and water spots in the same area is often not interrelated. Field counts carried out in 1937 confirmed the experimental results.

BAKER (R. E. D.). **Red root disease of Limes in the British West Indies.**—*Trop. Agriculture, Trin.*, xv, 5, pp. 105–108, 1938.

The author sums up the present extent of our knowledge of the red root disease of limes [*R.A.M.*, xv, pp. 2, 717], destructive outbreaks of which occurred in Dominica (1927), Montserrat (1933), and St. Lucia (1934). No conclusive evidence as to the status of *Sphaerostilbe repens* as a primary cause of the disease has yet been found and the part played possibly by other fungi, the citrus weevil, hurricanes, and other metereological conditions require further investigation. In recent studies by the author in St. Lucia, some 60 trees were dug up and their roots examined. Of 44 dead and dying seedling trees present, 19 showed no trace of *S. repens*, 15 showed only traces of the fungus on dead roots which must have died from some other cause, and 10 showed the fungus in considerable quantity. The author thinks that, though the fungus may behave as a parasite under certain conditions, it is more often found as a saprophyte, and that factors predisposing the seedling lime trees to attack by *S. repens* are of more importance than the presence of the fungus itself. It has been previously recommended by Briton-Jones (in an unpublished report) and is again advised by the author that lime trees should be planted budded on the sour orange resistant

to red root disease and gummosis [chiefly *Phytophthora parasitica*: ibid., xvi, p. 312], taking great care to ensure that the seeds come from the true sour orange and not from various other citrus varieties similar in appearance but susceptible to these diseases. Furthermore, the sour orange in Trinidad is subject to a totally unexplained root disease and it is suggested that a study of this disease and of the different types of citrus used for stocks should be made with a view to determining the best stock for each area.

Bahrt (G. M.) & Hughes (A. E.). **Soil fertility and experiments on bronzing of Citrus.**—*Proc. Fla hort. Soc.*, l, pp. 23–28, 1937. [Abs. in *Chem. Abstr.*, xxxii, 12, p. 4709, 1938.]

Studies on the chlorotic condition of citrus foliage known as 'bronzing' in Florida [*R.A.M.*, xiv, p. 442] showed that the affected leaves occur mostly on the next-to-youngest growth or early spring flush. Four distinct types of the disorder were observed and are described. As the stages of bronzing advanced the magnesium content of the foliage decreased and the calcium : magnesium ratio increased. Where magnesium was applied to the soil in supplements to complete fertilizers bronzing decreased and the maximum fruit yields were usually obtained from the least affected trees. The most promising treatments for the control of the disease were calcined kieserite, dolomitic limestone, manganese sulphate, and ground calcium limestone, supplemented by magnesium sulphate, in addition to a complete fertilizer.

Ezekiel (W. N.). **Evaluation of some soil fungicides by laboratory tests with Phymatotrichum omnivorum.**—*J. agric. Res.*, lvi, 8, pp. 553–578, 1 fig., 1938.

After briefly describing the methods developed for determining in the laboratory the capacity of fungicides to permeate soil and their fungistatic (growth-inhibiting) and fungicidal efficiency in the control of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xvii, p. 596 and next abstracts] the author gives a tabulated account of the results so far obtained in these investigations, which were started in 1928 and have already been noticed in part [ibid., xiii, p. 698]. The relative efficacy of a number of organic mercury compounds when mechanically mixed into soil is indicated in a table, as determined in tests with soil inoculated with composite sclerotial material of the fungus in closed jars. The initial fungistatic efficiency of ethyl mercury compounds was found to be much higher than would be expected from their mercury content, but their residual value after five weeks' contact with moist soil was in line with that of other compounds. Similar tests, in which the fungicides were applied to the surface of Houston black clay soil, showed that a group of volatile substances, including pentachlorethane, tetrachlorethane, xylene, carbon disulphide, turpentine, perchlorethylene, trichlorethylene, and dichlorethylene, at the rate of only 100 parts per million of the air-dry soil, completely inhibited growth from inoculum 13·5 cm. deep in the soil. Formaldehyde was ineffective at 4,000 p.p.m., and ammonia did not prevent growth even at 10,000 p.p.m. The organic mercury compounds tested inhibited growth near the surface but not from deeper inoculum. Four to eight weeks' contact of

pentachlorethane with moist surface soil reduced its initial fungistatic efficiency to between one-fifth and one-tenth of the original value. Higher concentrations (500 to 1,000 p.p.m.) appeared to be necessary to ensure the growth-inhibiting action of pentachlorethane, tetrachlorethane, and xylene in very compact soil, or with infected roots used as inoculum, or when the jars were left open and fanned to accelerate the evaporation of the fungicides. In the open jars inserting the substances in holes below the surface appeared to be much more advantageous than surface application. While these substances are suggested for trial in field experiments, none of the compounds enumerated in this report is recommended at this time for practical use against cotton root rot.

EZEKIEL (W. N.). **Tests with pentachlorethane, tetrachlorethane, and xylol to determine their efficiency in eradication of Phymatotrichum root rot.**—*J. agric. Res.*, lvi, 8, pp. 579–593, 3 diags., 1938.

An account is given of field trials conducted over two years in Texas, the results of which are stated not to justify the recommendation of tetrachlorethane, pentachlorethane, or xylol [see preceding abstract] for practical use in the control of cotton root rot (*Phymatotrichum omnivorum*).

EZEKIEL (W. N.) & FUDGE (J. F.). **Studies on the cause of immunity of monocotyledonous plants to Phymatotrichum root rot.**—*J. agric. Res.*, lvi, 10, pp. 773–786, 1 fig., 1 diag., 1938.

In the work summarized in this paper the action of different fractions of the juices expressed from the roots of a number of mono- and dicotyledonous plants was tested on the growth of *Phymatotrichum omnivorum* [*R.A.M.*, xi, p. 640; xii, p. 691; and preceding and next abstracts] in pure culture. The results showed that the ether extracts of juices from the roots of monocotyledons, all of which are immune from the fungus, inhibited the growth of the latter, while those from the roots of susceptible dicotyledons had no inhibitory effect. The aqueous residues of juices from both immune and susceptible plants prevented growth when added to the culture solutions. In the ether extracts from all the monocotyledons tested, growth inhibiting material was found in a fraction with the following characteristics: solubility in ether, from which it cannot be washed by water or precipitated by acetone; solubility in aqueous sodium carbonate solution, from which it is recovered in ether after slight acidification; relative insolubility in petroleum ether as compared to ethyl ether; probable solubility in alcohols. Such fractions were approximately 100 times as potent on a dry matter basis as the original juice, and completely inhibited the growth of *P. omnivorum* when added to nutrient solutions in amounts that supplied from 0·02 to 0·09 per cent. of material. Fractions of this kind were prepared from onion bulbs, gladiolus corms, and from the roots of giant reed (*Arundo donax*), *Canna* sp., *Hemerocallis* sp., and Johnson grass (*Sorghum halepense*). Onion juice was found to contain an additional potent fraction, insoluble in sodium carbonate solution, but apparently slowly saponifiable in alcoholic potassium hydroxide. Potent ether fractions were also found in the juices from the less susceptible potato and turnip varieties, suggesting that these fractions

may be associated with differences in the susceptibility to root rot of various dicotyledonous families and species. The general inference drawn from this work is that the immunity of monocotyledons to root rot is due, at least in part, to the presence in the roots of minute quantities of acidic, ether-soluble substances, possibly organic acids or esters.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **A rating of plants with reference to their relative resistance or susceptibility to Phymatotrichum root rot.**—*Bull. Tex. agric. Exp. Sta.* 527, 52 pp., 1936. [Received June, 1938.]

This bulletin supplies information on the relative susceptibility or resistance to the cotton root rot fungus (*Phymatotrichum omnivorum*) [see preceding abstracts] of 2,116 species of plants, belonging to 131 families, arranged alphabetically by their Latin names under each family. The root rot ratings shown in the list are based on the percentage of plants which developed visible symptoms of the disease when exposed to infection under favourable conditions.

BIRAGHI (A.). **Una 'mummificazione' del Cotone causata da Alternaria.** [A mummification of Cotton caused by *Alternaria*.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 4, pp. 475–496, 1 pl., 9 figs., 1 graph, 1937 (issued April, 1938).

In October, 1937, the author received from the vicinity of Rome a few locally grown cotton bolls the carpels of which were withered and contained a mass of black, mummified fibres. A species of *Alternaria* was present on and in the fibres, with conidia arranged in chains of 4 to 5 or more; the conidia had a hyaline beak, 1 to 7 transverse and occasional oblique and longitudinal septa, and were more or less markedly constricted at the septa. They measured 14 to 66μ long (including a beak of 3 to 47μ and a length of 11 to 44μ excluding the beak) and 7 to 16μ broad. In culture the fungus formed woolly colonies with a slight, white efflorescence and the corresponding measurements for the conidia from month-old cultures were 16 to 114μ (2 to 76μ and 10 to 70μ) and 6 to 14μ. On the outside of the withered carpels was found another *Alternaria* with very few, darker, smaller conidia with shorter beaks. Cultures from the surface of the carpels gave carbonaceous colonies with a very short aerial mycelium; in month-old cultures the conidial measurements were 11 to 56μ long (2 to 24μ and 7 to 44μ) and 6 to 13μ broad.

In discussing the systematic position of the species of *Alternaria* reported as causing cotton leaf spot, the author points out that Hopkins provisionally referred his organism observed in Rhodesia to *A. gossypina* (Thüm.) [*R.A.M.*, xi, pp. 371, 638] on the assumption that Thümen's measurement for the length of the conidia did not include the beak, an assumption with which the author does not agree. Hopkins's fungus appears to him to be near to *A. macrospora* [ibid., viii, p. 171; xi, p. 638], in which the beak averages the same length as the conidium itself. In his opinion, all the *Alternaria* forms (including Hopkins's) reported as causing cotton leaf spot belong to one species or group, which can be referred to *A. macrospora* by reason of the identity of the host, the etiology of the disease, and the characters of the fungus.

The fungus found by the author in the bolls is referred to *A. macrospora*. That present on the carpels may possibly be *A. gossypina*, the characteristics on which this opinion is based being mainly the shortness of the beak, the very slightly marked constrictions, their number, and the dimensions of the conidia; in addition, the author's fungus appears to be saprophytic.

LEPESME (P.). **Recherches sur une aspergillose des Acridiens.** [Studies on an aspergillosis of Acridians.]—*Bull. Soc. Hist. nat. Afr. N.*, xxix, 5, pp. 372–381, 2 pl., 2 figs., 1938.

Further studies on the locust (*Schistocerca gregaria* and *Locusta migratoria*) disease recently reported from the Central Laboratory of Locust Biology, Natural History Museum, Algiers, as associated with *Bacillus prodigiosus* [*Bacterium prodigiosum: R.A.M.*, xvii, p. 173] denote that the primary cause of the epidemic is a fungus, *Aspergillus flavus* [ibid., xi, p. 696], the agent of stone brood of bees [ibid., viii, p. 105; ix, pp. 524, 591; xvi, p. 673], and a cause of infection of *Pseudococcus sacchari* in Egypt [ibid., xiii, p. 94], of *Pyrausta nubilalis* [ibid., xiii, p. 574], and of silk-worms [ibid., viii, p. 105].

The affected insects bore extensive ochraceous patches on the sternum and thoracic cavities and developed progressive muscular paralysis ending in sudden death, 24 hours after which the white, later greenish-olive conidiophores of the fungus spread over the entire body. Under natural conditions infection invariably occurs through the wing muscles, near a thoracic stigma, and in inoculation experiments this was also the most favourable channel for the entry of the fungus, abdominal infections being much more difficult to secure, while all attempts to introduce the organism through the tegument or buccal cavity gave negative results. The epidemic development of *A. flavus* on locusts is favoured by high temperatures (30° to 45° C.) and moderate to high humidity, and may be prevented by adjusting these factors within appropriate limits.

JANISCH (E.). **Eine neue Pilzkrankheit bei Nonnenraupen.** [A new fungous disease of Nun Moth larvae.]—*Arb. phys. angew. Ent.*, v, 1, pp. 1–20, 5 figs., 4 graphs, 1938.

Nun moth [*Lymantria monacha*] larvae in a 91-year-old pine stand interspersed with old beeches near Berlin were attacked in March, 1937, by a virulent epidemic due to *Aspergillus versicolor* [*R.A.M.*, xiv, p. 585] hitherto known only as a saprophyte and not previously recorded on *L. monacha*. The pathogenicity of the fungus was established by laboratory and field inoculation experiments, the optimum temperature and relative humidity for infection being about 22° C. and 90 per cent., respectively. Insects fed on oak leaves succumbed more readily to the disease than those given pine needles. External symptoms of infection include crippling of the prolegs and sternum, especially after a moult. The fungus was also pathogenic to silkworms [*Bombyx mori*], the pine Noctuid [*Panolis flammea*], and the pine Geometrid [*Bupalus piniarius*].

LODDER (J[ACOMINA]). **Torulopsis or Cryptococcus?**—*Mycopathologia*, i, 1, pp. 62–67, 1938.

At a meeting between the representatives of the American Committee

on Taxonomy and Nomenclature and the staff of the Yeast Division of the Centraalbureau voor Schimmelcultures on 23rd July, 1936, at Baarn, Holland, the author presented detailed evidence which led the members present to conclude that the use of the generic name *Cryptococcus* Kützing should be avoided in yeast taxonomy [cf. *R.A.M.*, viii, p. 677] as it is both a 'nomen dubium' and a 'nomen confusum', the former because doubt exists whether the first species of *Cryptococcus* described by Kützing, *C. mollis*, actually was a yeast, Kützing himself classifying the genus among the algae, and the latter because examination of authentic herbarium material of *C. mollis* showed it to consist of a mixture of at least five organisms.

On the other hand, it was agreed that while there were several arguments in favour of the generic name *Torulopsis* Berlese, as a valid name for a group of asporogenous yeasts, further information was required regarding Berlese's original diagnosis, since the first species described by him, *T. rosae*, apparently referred to a red yeast, probably belonging to *Rhodotorula* Harrison. A subsequent study of Berlese's diagnosis, however, has shown that he purposely included in his diagnosis the yeasts at that time referred to the genus *Torula* sensu Pasteur-Hansen. Furthermore, the diagnosis of *T. rosea* shows that it was a yeast with a strong fermentative power, and since the carotin red yeasts never cause fermentation it cannot belong to *Rhodotorula*. All the available evidence favours the opinion that Berlese's species was identical with *Torulopsis pulcherrima* (Lindner) Sacc. The author submits that the validity of the generic name *Torulopsis* for the asporogenous, non-mycelium-forming, colourless yeasts may now be considered as proved and suggests that the genus *Torulopsis* Berlese may be defined as cells round, oval, or rarely oblong, reproduced by much lateral budding, without the formation of pseudomycelium, true mycelium, ascospores, or carotin pigments.

Don (Phyllis A.). **Moniliasis.**—*S. Afr. med. J.*, xii, 2, pp. 49–51, 1938.

This is a clear survey of some important aspects of the knowledge at present available concerning the classification and morphology of the *Monilia* group of fungi, and their etiological relationship to various pathological conditions of man. The current tendency is to classify the pathogenic members of the group as *M.* [*Candida*] *albicans* [see next abstracts] or a variant of this species, and the non-pathogenic as *M. candida* [*C. vulgaris*: *R.A.M.*, xvii, p. 527]. In connexion with the potential implication of *C. albicans* in the various diseases under discussion it is mentioned that 18 per cent. of normal persons harbour the organism in the mouth or intestinal tract and may consequently act as unsuspected carriers.

Besta (B.). **Il fenomeno della dissociazione in uno stipite di 'Mycotorula albicans'.** [The phenomenon of dissociation in a strain of *Mycotorula albicans*.]—*Mycopathologia*, i, 1, pp. 41–52, 2 pl., 1938. [English summary.]

From a strain of *Mycotorula* [*Candida*] *albicans* [see preceding and next abstracts] obtained from the sputum of a patient affected with a non-tubercular lesion of the lung and which gave colonies of the

normal S type, the author obtained a rough, verrucose colony allied to Arkwright's R phase. A comparative study of the micro- and macro-morphological and biochemical characters [which are described] of the two strains indicated that so-called dissociation in this species is related to a moderate polymorphism and polymetry of the yeast cells.

ELOY (L.). **Mycose et phlegmon récidivant chez l'enfant après amygdalectomie (irradiations-guérison).** [Mycosis and relapsing phlegmon in a child following tonsillectomy cure (by irradiations).] *Monde méd.*, xlviii, 910, pp. 46–50, 1938.

Clinical details are given of a case of relapsing phlegmon in a twelve-year-old girl in Brussels associated with the presence in the tonsillar crypt of *Oidium* [*Candida*] *albicans* [*R.A.M.*, xvii, p. 527 and preceding and next abstracts]. A complete cure was effected by radiotherapy.

OWEN (CORA R.), ANDERSON (M. B.), & HENRICI (A. T.). **Allergy in Monilia and yeast infections.**—*Mycopathologia*, i, 1, pp. 10–25, 1938.

After a critical review of the literature on the occurrence of allergic reactions to yeasts and *Monilia* species the authors describe in detail three series of experiments made on laboratory animals to ascertain the part played by allergy in the development of mycoses caused by these organisms. The investigations consisted of sensitization experiments with *Monilia* [*Candida*] *albicans* and *Debaryomyces neoformans* [see preceding and next abstracts] and cross-sensitization experiments with various yeasts and strains of *C. albicans*. The following tentative conclusions are reached. Spontaneous infections with yeasts and species of *Monilia* may result in an allergic state manifested by generalized eruptions ('ids') and also by the results of skin tests; such an allergic state is generally harmful rather than beneficial and may even be fatal. Sensitization may in some cases be a pre-requisite for infection. Unequivocal results from skin tests can be obtained, apparently, only by inoculation of the living cells; the reacting substance appears to be closely bound to the cells, and is thermolabile. Sensitization is broadly specific, cross-reactions with sporotrichin and trichophytin being lacking. There is only very slight specificity within the yeast-*Candida* group, cross-reactions being common. The authors consider that their most important observation is that the ability of a strain to sensitize and elicit reactions is correlated with its potential virulence, even when the strain is not virulent for the test animal. Thus yeasts of human origin gave more sensitivity and stronger reactions in rabbits than did saprophytic yeasts. Strains of *Candida* pathogenic to rabbits gave more sensitivity and stronger reactions in rabbits than did strains not pathogenic to rabbits.

DUCUING (J.), BASSAL (L.), & MILETZKI (O.). **Tumeur osseuse de l'orbite à allure cancéreuse déterminée par le Torulopsis neoformans.** [A bony tumour of the orbit simulating cancer caused by *Torulopsis neoformans*.]—*Bull. Ass. franç. Cancer*, xxvi, 6, pp. 580–584, 2 figs., 1937.

The organism isolated from a tumour on the right orbital rim of a

75-year-old woman was identified by M. Langeron and P. Guérin, on the basis of its cultural and morphological characters, as *Torulopsis* [*Debaryomyces*] *neoformans* [see preceding and next abstracts].

Fawcitt (R.). **Occupational diseases of the lungs in agricultural workers.**—*Brit. J. Radiol.*, N.S., xi, 126, pp. 378–392, 13 figs., 1938.

Much of the subject matter of this paper on bronchomycoses of agricultural workers has been noticed from the author's previous work [*R.A.M.*, xvii, p. 529]. The following record may be mentioned: *Absidia corymbifera*, a fungus associated with the nasal mucous membrane of horses, pigs, and cattle, was isolated in one case from the sputum of a stableman.

Benedek (T.). **Further investigations on Bacillus endoparasiticus (morphology and systematic position of Schizosaccharomyces hominis Benedek, 1927, a constant endoparasite in Man).**—*Mycopathologia*, i, 1, pp. 26–39, 3 pl., 1938.

Further protracted investigations [which are described] on *Schizosaccharomyces hominis* [= *Mycoderma hominis* (Ben.) Vuill.: *R.A.M.*, xvii, p. 242] have convinced the author that the organism is a constant endoparasite in man, and have also shown that it is a spore-forming bacillus, for which reason the name *Bacillus endoparasiticus* is suggested for it.

Moore (M.). **Cultivation of Malassezia furfur, etiological agent of pityriasis (tinea) versicolor.**—*Mycopathologia*, i, 1, pp. 53–61, 8 pl., 1938.

In the stratum corneum of early lesions of pityriasis versicolor the causal fungus (*Malassezia furfur*) [*R.A.M.*, xvii, p. 599] shows a fine, filamentous, branching mycelium 1½ to 2μ in diameter. As the lesions become older the organism develops cross walls, forming short hyphal cells measuring approximately 10 to 16 by 1½ to 4μ, which produce arthrospore-like cells; these become spherical, and then free, measure approximately 3 to 6 (occasionally 8)μ in diameter, and form the clusters found in old lesions.

On two occasions the author succeeded in culturing *M. furfur* from infected scales in a solution of peptone (1 per cent.) and maltose (4 per cent.) incubated at 37° C. Subcultures on agar media varied from flat and dull, moist and shiny or mucoid and stringy, punctate, vermiform, cerebriform, to rugose, crateriform, verrucose, vermiculate, and somewhat velvety; some showed small blebs, and wort agar produced an arborescent type of growth. All the characteristics seen in the natural host were observed microscopically in the cultures (including the formation of spherical, thick-walled, arthrospore-like cells up to 10μ in diameter), except that the fungus elements in the cultures were larger. On various media, which became dark with age, the fungus produced a creamy-buff, dull grey to ochraceous-buff and dark cinnamon pigmentation resembling that seen in lesions. The biochemical reactions included liquefaction of gelatine in 5 days, starting at the surface, acidification of litmus milk after 10 days, with no curdling, production of acid without gas from dextrose, d-xylose, amygdalin, and d-levulose, and no

acid or gas production from maltose, lactose, saccharose, d-galactose, rhamnose, raffinose, dextrin, d-mannitol, l-arabinose, and starch.

Intracutaneous and intratesticular inoculations on rabbits and guinea-pigs produced granulomatous lesions which were heavily infiltrated, erythematous, hard, and persistent. Human inoculations gave positive results in 3 out of 8 cases. The fungus is temporarily placed in the Eremascacaceae Imperfectae as a distinct genus with *M. furfur* as the type species.

GODAL (J.). **Un cas d'épidermophytie généralisée à Trichophyton rubrum.** [A case of generalized epidermophytosis due to *Trichophyton rubrum*.]—*Bull. Soc. Path. exot.*, xxxi, 5, pp. 337–339, 1938.

Clinical details are given of a case of generalized epidermophytosis due to *Trichophyton rubrum* [*R.A.M.*, xvii, p. 599] investigated at the Maritime Hospital, Rochefort, France. The patient had been on military service in Indo-China, where the disease was presumably contracted, the causal organism being of rare occurrence in France.

LEWIS (G. M.), MONTGOMERY (R. M.), & HOPPER (MARY E.). **Cutaneous manifestations of Trichophyton purpureum.**—*Arch. Derm. Syph., Chicago*, xxxvii, 5, pp. 823–839, 8 figs., 1938.

Trichophyton purpureum [*R.A.M.*, xvii, p. 321] was isolated from 100 cases (63 males and 37 females) of fungus infection involving various parts of the body. There is some reason to believe that this organism is becoming more prevalent in New York than formerly. Three of the cases (all adult males) are described in detail. The various clinical manifestations of the fungus may simulate psoriasis, arsenical keratosis, neurodermatitis, eczema, sycosis vulgaris, and erythema annulare centrifugum (Darier). Two rare instances are recorded, one of infection of all the nails of the hands and feet and one of follicular involvement. The reaction to trichophytin of patients infected by *T. purpureum* is slightly positive or negative. The histologic picture is consistently that of a simple inflammatory process, but the lesions caused by the fungus are very refractory to therapeutic treatment.

CATANEI (A.). **Sur les rapports entre les caractères des cultures des Trichophyton violaceum et glabrum et leur pouvoir pathogène pour les animaux.** [On the relations between the cultural characters of *Trichophyton violaceum* and *glabrum* and their pathogenicity to animals.]—*C.R. Soc. Biol., Paris*, cxxviii, 17, pp. 255–256, 1938.

Guinea-pigs inoculated at the Pasteur Institute of Algeria with rice agar cultures of *Trichophyton violaceum* and *T. glabrum* bearing conidia [*R.A.M.*, xvii, p. 38] responded much more readily to infection than those treated with cultures of the same fungi from Sabouraud's medium on which no fructifications develop. Retrocultures were obtained in all cases. The pathogenicity of these species is thus evidently enhanced by cultivation on a substratum stimulating reproductive activity.

PIGNOT (M.), RABUT (R.), & RIVALIER (E.). **La teigne à l'École Lailler de 1930 à 1937.** [Ringworm at the 'École Lailler' from 1930 to 1937.]—*Pr. méd.*, xlvi, 19, pp. 345–347, 1938.

During the period from 1930 to 1937, 1,117 children were treated

for ringworm at the 'École Lailler' (the dermatological department of the Saint-Louis Hospital, Paris), and of these 1,061 yielded material for microscopic examination. The disorders investigated were distributed as follows: 542 cases of microsporosis (75 per cent. *Microsporon audouini* [*R.A.M.*, xvii, pp. 174, 244, 599], 25 per cent. *M. lanosum* [ibid., xvii, p. 599], 306 of trichophytosis (53 per cent. *Trichophyton crateriforme* [ibid., xvi, pp. 179, 535], 22 per cent. *T. acuminatum* [ibid., xvi, p. 317], and 25 per cent. *T. violaceum* [see preceding abstract]), 186 of favus [?*Achorion* spp.], 25 of animal ringworms and 2 of mixed origin. Details are given of the methods of detection and diagnosis employed, inoculation and injection experiments, and therapeutic technique, mostly by irradiation.

Milochevitch (S.) & Ekersdorf (V.). **Lésions pilaires dans les teignes expérimentales produites par les cultures pléomorphiques des dermatophytes.** [Pilary lesions in the ringworms experimentally induced by pleomorphic cultures of dermatophytes.]—*C.R. Soc. Biol., Paris*, cxxvii, 13, pp. 1369–1371, 1938.

Only four of the eight dermatophytes used in experiments on guinea-pigs at the Central Institute of Hygiene, Belgrade, to determine the pathogenicity of pleomorphic cultures gave positive results, viz., *Sabouraudites felineus* [*Microsporon felineum*], *S. lanosus* [*M. lanosum*], *Ctenomyces* [*Trichophyton*] *mentagrophytes*, and *C.* [*T.*] *radiolatus*, and the degree of parasitization was very restricted. Only a very few hairs were involved, and in some cases infection was limited to the epidermis. It is evident from these observations that the infectivity of pleomorphic cultures tends steadily to diminish and is ultimately lost.

Adams (J.) & Parfitt (E. H.). **Studies on the mold mycelia of sour cream butter.**—Abs. in *J. Dairy Sci.*, xxi, 5, pp. 147–148, 1938.

Commercial samples of butter manufactured between 1st August and 1st April were examined for the presence of [unspecified] mould mycelia with the aid of Wildman's technique [*R.A.M.*, xvi, p. 536] at Purdue University, Indiana. The mycelial content of the butter showed a definite seasonal trend, being highest during the summer and lowest in the winter months. Of 205 samples taken during December and January, 99 per cent. of the 103 first-grade and 41 per cent. of the 102 second-grade samples yielded mycelial counts of less than 40 per cent. positive fields. The retention of mould mycelia in butter was found to range from 30 to 60 per cent. of the total mould content of the cream. The mould mycelial count of the butter was found to be influenced by various factors affecting the contamination of the cream, e.g., age, incubation temperature, amount of cream surface exposed to air, and agitation of cream during holding.

Shadwick (G. W.). **A study of comparative methods and media used in microbiological examination of creamery butter. I. Yeast and mold counts.**—*Food Res.*, iii, 3, pp. 287–298, 1938.

Full details are given of studies at the Beatrice Creamery Company,

Chicago, on comparative methods for determining the yeast and mould counts of salted and unsalted butters [see preceding abstract].

TASUGI (H.) & KUMAZAWA (M.). **Phytophthora rot of Lily.**—*J. imp. agric. Exp. Sta.*, iii, 2, pp. 207–238, 3 pl., 3 graphs, 1938. [Japanese, with English summary.]

A specimen of *Lilium auratum* suffering from a greyish-brown blight of the leaves, stems, flowers, and bulbs in the Saitama Prefecture, Japan, in 1934, yielded a species of *Phytophthora* which the authors compared with three other isolates of this genus obtained from *L. elegans*, *L. longiflorum*, and *L. dahuricum* in different parts of the country. Of the four organisms, the two from *L. elegans* and *L. longiflorum* were identified as *P. parasitica* and the other two (from *L. dahuricum* and the specimen of *L. auratum* under observation) as *P. cactorum* [*R.A.M.*, xiv, pp. 147, 399]. Both strains of *P. parasitica* grew well on bean, potato, oatmeal, and maize meal agars, the first-named being the most suitable, and developed throughout a temperature range of about 4·5° to 35° C.; the optimum for the *L. elegans* strain was from 24° to 28° and for that from *L. longiflorum* just below 28°. Both strains flourished at P_H 5·1. The strain of *P. cactorum* isolated from *L. dahuricum* also made good growth on the above-mentioned media between 4·5° and 31°, with an optimum at 24°, the most favourable hydrogen-ion concentration being P_H 5·1 or slightly higher. The average oospore diameter of *P. parasitica* from *L. elegans* was found to be 20·5μ, the corresponding figures for *P. cactorum* from *L. dahuricum* and *L. auratum* being 23 and 23·6μ, respectively. In inoculation experiments on *L. longiflorum* and *L. elegans* the *P. parasitica* strains produced much more rapid and virulent rot than those of *P. cactorum*.

ROSEN (H. R.). **Arkansas disease-control work in 1937.**—*Amer. Rose Annu., 1938*, pp. 146–148, 1938.

Observations at the Arkansas Agricultural Experiment Station during 1936–7 showed that the mycelium of the fungus causing black spot of roses [*Diplocarpon rosae*: *R.A.M.*, xvii, p. 590 and next abstracts] persists through the winter in old leaves clinging to the bushes and produces a fresh crop of conidia to disseminate infection in the spring. Under local conditions the foliage is much more liable to attack than the stems. Kolotex [ibid., xiii, p. 528] gave very good results in the control both of black spot on hybrid tea roses and powdery mildew [*Sphaerotheca pannosa*] on climbers, but had to be discontinued in July on account of severe burning of the leaves. Hybrid tea roses showing an exceptional degree of resistance to *D. rosae* are Safrano, Duchesse de Brabant, Isabella Sprunt, Mlle Franziska Krüger, and Mrs. B. R. Cant. Such varieties respond very unfavourably to fungicidal treatment.

PAPE (H.). **Die wichtigsten Rosenkrankheiten und Rosenschädlinge und ihre Bekämpfung.** [The most important Rose diseases and Rose pests and their control.]—*Rosenjahrb.*, *1938*, 2, pp. 56–67, 1938.

This is a useful survey of the principal diseases and pests of roses in Germany, together with brief, practical directions for their control.

In order to guard against infection by *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xiv, p. 313] the roots should be dipped at transplanting in a loam emulsion containing a disinfectant solution, e.g., uspulun or ceresan (liquid), either of which may also be used to paint the graft union sites; two or four weeks before planting sulphur dust should be incorporated with the soil at the rate of 50 to 100 gm. per sq. m.

The bark spot disease due to *Coniothyrium wernsdorffiae* [ibid., xv, p. 22] may be combated by the excision of infected material, application of tree wax or carbolineum to the wounds, and repeated summer treatments with 1 per cent. Bordeaux mixture plus saponin or tezet 10 [ibid., xv, p. 508], followed by a pre-dormancy spray of 2 per cent. Bordeaux mixture, lime-sulphur (10 in 90), or milk of lime to the stems and branches after removal of all remnants of foliage. The susceptible Crimson Rambler should not be cultivated where this disease is to be feared.

Mildew (*Sphaerotheca pannosa*) [ibid., xv, p. 298 and next abstract] also occurs in a virulent form on Crimson Ramblers, which may be replaced by the relatively resistant American Pillar, Blush Rambler, Carmine Pillar, Lady Gay, Alberic Barbier, Excelsa, Eisenach, or Paul's Scarlet Climber. At the first signs of infection, applications of 'ventilated' sulphur, sulphur dust, lime-sulphur (1¼ to 2 in 100), erysit [ibid., xvi, p. 322], or vomasol S [ibid., xv, p. 583] should be started and continued at 10- to 14-day intervals throughout the season. In the late autumn and early spring the bushes should be treated with lime-sulphur (10 in 90).

Autumn and spring treatment with lime-sulphur, 2 per cent. Bordeaux mixture, or 2 to 8 per cent. carbolineum is effective against rust (*Phragmidium mucronatum*) [ibid., xvii, p. 532]. Repeated summer treatments with 1 per cent. Bordeaux or Burgundy mixture or a recognized commercial preparation are recommended.

Black spot (*Diplocarpon rosae*) [see preceding and next abstracts] also yields to frequent spring and summer applications of 1 per cent. Bordeaux mixture, lime-sulphur, or sulphur dust, supplemented by dormant treatments of the bushes and underlying soil with 6 per cent. carbolineum and by stringent sanitation. Among the numerous varieties suffering comparatively little from black spot may be mentioned Königin Luise, Golden Ophelia, Betty Uprichard, Ami Quinard, Edith Nellie Perkins, Red Radiance, Crimson Glory, Mrs. Pierre S. du Pont, Pink China, *Rosa nitida*, *R. moyesii*, *R. hugonis*, and *R. nuttaliana*.

Repeated applications of an approved fungicide are advocated for the control of downy mildew (*Peronospora sparsa*) [ibid., xiv, p. 313]. Strict attention to sanitation of the beds and houses, provision of ample ventilation, avoidance of extreme humidity, and other cultural measures will help to eliminate both this disease and grey mould (*Botrytis cinerea*) [loc. cit. and ibid., xiv, p. 363].

Suit (R. F.). **Red copper oxide up to date.**—*Amer. Rose Annu., 1938*, pp. 153–157, 1938.

The best control of black spot [*Diplocarpon rosae*] on hybrid tea roses [see preceding abstracts] in a comparative experiment with various fungicides at Clifton Springs, New York, in 1937 was obtained with

sulphur dust 90–10, which reduced the proportion of moderately and severely diseased plants from 89·1 to 9·1 per cent. Red copper oxide, cupro-K [*R.A.M.*, xvii, p. 608], and cuprocide 54 at 0·44 oz. plus ½ per cent. soluble cottonseed oil came next in efficacy. Sulphur dust and red copper oxide also gave the best control of mildew [*Sphaerotheca pannosa*: ibid., xvii, p. 585], while cuprocide 54, tri-ogen, and Cupro-K were fairly satisfactory in this respect. Detailed directions for the application of the various materials are given.

RATSEK (J. C.). **The probable effect of peduncle abscission on the incidence of 'die-back' of Roses.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 788–794, 1 fig., 1938.

Certain varieties of field-grown rose bushes in eastern Texas are affected by a die-back chiefly due, according to Taubenhaus and Boyd (*Rep. Tex. agric. Exp. Sta.*, pp. 19–21, 1935), to a species of *Diplodia* [*R.A.M.*, xvii, p. 590]. The condition is characterized by a blackening of the peduncle after the bloom shatters, the necrosis spreading down the peduncle and sometimes entering the rose cane. If abscission of the peduncle occurs before the fungus enters the main cane no damage is done, but if the cane is invaded, the necrotic area descends, and the whole branch may succumb. The dead tissue later turns silvery-grey or light tan, and black spore masses are visible to the naked eye. Hybrid tea roses with Pernetiana 'blood' are highly susceptible. The condition is most serious after protracted wet periods. One-year forced budded plants are only slightly susceptible, though two-year budded plants of the same variety are frequently killed. High nitrate applications after hard pruning, especially when accompanied by high soil moisture and desiccation at harvest time and afterwards, greatly increase incidence. It appears that naturally weak varieties, particularly when in a weakened condition, are most susceptible to attack.

Experimental data are given showing that defoliation increased die-back (from 8·99 per cent. in the controls to 78·54 per cent. when all the leaves were removed) and that disbudding slightly decreased it. Factors tending to provide a rapid supply of food to the abscission layer increase the rapidity of abscission, and cultural methods that will increase the supply of available food reduce the incidence of the disease.

JENKINS (ANNA E.) & MASSEY (L. M.). **Rose anthracnose.**—*Amer. Rose Annu., 1938*, pp. 136–141, 2 pl., 1 fig., 1 map, 1938.

The available information on the distribution, history, life-cycle, symptomatology, and control of rose anthracnose (*Sphaceloma rosarum*) is summarized, with special reference to United States conditions [*R.A.M.*, xvii, p. 325 and next abstract].

JENKINS (ANNA E.) & MCWHORTER (F. P.). **Additional records of Rose anthracnose in the United States.**—*Phytopathology*, xxviii, 5, pp. 360–363, 1 fig., 1938.

Further details are given concerning the distribution of rose anthracnose (*Sphaceloma rosarum*) in North Carolina, Oregon, Michigan, and Tennessee [see preceding abstract].

McWhorter (F. P.). **Narcissus mosaic and early maturity.**—*Plant Dis. Reptr*, xxii, 9, pp. 147–148, 1938. [Mimeographed.]

During recent years the mosaic content of the better narcissus [*R.A.M.*, xvii, p. 604] varieties in the average plantings found in the north-western parts of the United States has been reduced to between 0 and 2 per cent. Meantime, however, another condition has developed that leads to early maturity, with resulting degenerative effect. The affected plants show various striking symptoms, such as purple or white streaking, or breakdown of the terminal areas of the leaves into 'paper tips'. In the past five years the incidence of this condition has risen from a trace to 7 per cent. The attacked plants become conspicuous immediately after flowering, and may mature 30 to 60 days before the normal time. The most virulent form of the trouble yet noted by the author was in a consignment of the King Alfred [daffodil] variety received from Holland in 1937. The cause remains at present obscure. Observations on over 2,000 individuals demonstrated that it becomes fixed within clone units; immediate control may therefore be effected by roguing.

Pirone (P. P.). **Geranium crinkle in New Jersey.**—*Plant Dis. Reptr*, xxii, 9, p. 146, 1938. [Mimeographed.]

Crinkle disease [*R.A.M.*, xvii, p. 506] was observed recently for the first time on *Pelargonium zonale* plants in New Jersey, where in one greenhouse over 400 plants showed the characteristic irregular to circular chlorotic areas ½ to 2 mm. in diameter on ruffled, dwarfed young leaves. On old leaves the spots were generally circular, 2 to 5 mm. in diameter, and often showed two concentric rings. The condition closely resembles curly leaf, as described by Pape [ibid., vi, p. 728; see also next abstract]. According to the grower, the disease has appeared since 1933 on the Helen Michell, Ricard, and Olympic Red varieties; the Improved Ricard and Poitevine varieties appear to be less susceptible, and the white varieties seem to be immune. The symptoms, which are masked in summer, are most conspicuous in March and April. Cuttings taken early in February may appear to be normal, no symptoms appearing until the plants are 6 to 8 weeks old. It is assumed that much of the disease was probably transmitted through the cuttings, as the symptoms were masked when these were made.

Berkeley (G. H.). **Leaf curl of Geranium.**—*Canad. Hort.*, lxi, 4, p. 108, 1 fig., 1938.

In connexion with a case of leaf curl of the Helen Michell geranium [*Pelargonium zonale*: *R.A.M.*, xv, p. 444, and cf. preceding abstract] at St. Catharines, Ontario, in 1937, experiments were conducted which demonstrated the transmissibility of the disease from infected to healthy plants by means of grafting, the incubation period lasting about six months. Circumstantial evidence further indicates that whiteflies [Aleyrodidae] are concerned in the transmission of the disease, while suspicion also falls on *Macrosiphum pelargonii*.

Berkeley (G. H.). **Dahlia mosaic and its control.**—*Canad. Hort.*, lxi, 5, pp. 146–147, 5 figs., 1938.

The symptoms of dahlia mosaic [*R.A.M.*, xiv, p. 634] on such tolerant

varieties as Mrs. I. de Ver Warnar, Jane Cowl, Catharine Unwin, and Nettie Learmonth may be negligible in Ontario, where only one out of ten large gardens visited in 1937 was free from the disease, whereas the susceptible Croydon Beauty, Treasure Island, Frontenac, Goodnight, Countess of Lonsdale, and Ambassador respond to infection by severe stunting. Observations on 212 plants of over 50 varieties show that the symptoms may or may not persist throughout the season, but in any case they invariably reappear ultimately. Good control has been obtained by thorough roguing; in 1936 all diseased plants were dug out of a large planting at St. Catharines with 70 per cent. mosaic at the end of the season, thereby reducing the incidence of infection to 15 per cent. in the following year. Dahlia mosaic being spread by the peach aphid [*Myzus persicae*], new varieties or 'doubtful' stock should be segregated for at least a year. Ordinary stock purchased from commercial growers falls in the 'doubtful' category, only 22 out of 47 varieties purchased from such sources having been found healthy in 1937.

PRESTON (N. C.). **Successful control of Michaelmas Daisy wilt.**—*Gdnrs' Chron.*, ciii, 2681, p. 338, 2 figs. (1 on p. 339), 1938.

W. J. Dowson's recommendation for the control of Michaelmas daisy wilt (*Verticillium vilmorinii*) [*R.A.M.*, xi, p. 623] by striking cuttings from the tops of the newly formed shoots [ibid., iii, p. 39] does not seem to have been generally followed, but the writer has obtained very satisfactory results from this simple method. In 1932, 90·9 per cent. of the plants arising from 45 cuttings taken in this way from severely diseased stocks of the Queen Mary and Brightest and Best varieties in a Staffordshire nursery were free from disease, and a certain proportion of the sound material was returned to the grower to form the nucleus of a fresh stock. By the prompt removal of the few individuals since contracting the wilt from extraneous sources it has been possible to maintain beds of each variety in a clean and flourishing condition.

FOSTER (W. R.). **Control of Snapdragon rust (Puccinia antirrhini D. & W.).**—*Sci. Agric.*, xviii, 9, pp. 524–526, 1 pl., 1938.

The results of experiments in 1936 and 1937 at Victoria, British Columbia, showed that copper sprays were more effective than sulphur in the control of snapdragon [*Antirrhinum majus*] rust (*Puccinia antirrhini*) [*R.A.M.*, xvii, pp. 589, 602] in the coastal areas of the Dominion. Two applications of 4-4-40 Bordeaux mixture plus a spreader (1 lb. agral 2, 1 pt. lethalate [ibid., xvi, p. 797], or 2 qts. penetrol [loc. cit.] per 100 gals. spray) before the flowers began to open were sufficient to prevent the development of the rust on snapdragons grown for seed without any necessity for further applications. The protection from rust afforded to the seed crop by bouisol (1 pt. to 10 gals. water), bordinette (1 lb. to 10 gals.), copper hydro [ibid., xvii, p. 608] (1 lb. to 10 gals.), and 4-5-40 Burgundy mixture, with the addition to each of 1 lb. agral 2 per 100 gals. spray, was sufficient to warrant their trial on ornamental plants. The late appearance of the rust from 1934 to 1937 may be partly explained by the burning of volunteer and other snapdragon plants before spring.

England and Wales: new and interesting phytopathological records for the year 1937.—*Int. Bull. Pl. Prot.*, xii, 5, p. 97, 1938.

A severe outbreak of downy mildew (*Peronospora antirrhini*) [*R.A.M.*, xvii, pp. 43, 532] was observed among some 8,000 seedlings of the cultivated *Antirrhinum majus* in a nursery near Brighton. Those seedlings still in boxes were burnt immediately, together with the boxes and soil, and an attempt was made to remove and destroy those already planted out. The disease did not spread noticeably, and no other authentic outbreak has been reported in the country. *P. antirrhini* is stated to occur on the wild *A. orontium* in Europe.

Wenzl (H.). **Botrytis cinerea als Erreger einer Fleckenkrankheit der 'Cyclamen'-Blüten.** [*Botrytis cinerea* as the agent of a spot disease of *Cyclamen* flowers.]—*Phytopath. Z.*, xi, 1, pp. 107–108, 1938.

Cyclamen flowers were severely attacked in Austria in the exceptionally wet and cold late summer and autumn of 1937 by *Botrytis cinerea* [*R.A.M.*, vi, p. 164], which caused an unsightly spotting—dirty greyish-brown on white and pale pink varieties, water-soaked and discoloured on deep red ones, the lesions attaining a diameter of 2 to 3 mm.

Raabe (A.). **Ceratophorum setosum Kirchn. als Ursache eines Sämlingsterbens bei Ginster.** [*Ceratophorum setosum* Kirchn. as the cause of a dying-off of Broom seedlings.]—*Z. PflKrankh.*, xlviii, 5, pp. 231–232, 1 fig., 1938.

Ceratophorum setosum was isolated in July, 1937, from broom (*Sarothamnus* [*Cytisus*] *scoparius*) seedlings showing an extensive dark spotting of the leaves and stems [cf. *R.A.M.*, vii, p. 583] at three nursery-gardens in the Tübingen district of Germany. The disease assumed a virulent character, destroying the plants over an area of 1 are in a few days, and breaking out again in September after a pause in August. At the same time, white lupins (*Lupinus albus*) in the vicinity of Berlin and east Germany were severely attacked by the same fungus [ibid., xvi, p. 655].

Jenkins (Anna E.). **New records of anthracnose of Labrador Tea (Elsinoe ledi) and of Snowberry (Sphaceloma symphoricarpi).**—*Phytopathology*, xxviii, 5, pp. 374–375, 1 fig., 1938.

Further specimens of *Elsinoe ledi* on Labrador tea (*Ledum glandulosum*) have been collected in California and of *Sphaceloma symphoricarpi* on snowberry (*Symphoricarpus* sp.) in Oregon and New York State [*R.A.M.*, xii, p. 661].

Scupin (L.). **Ein Beitrag zur Ozonfrage.** [A contribution to the ozone question.]—*Obst- u. Gemüseb.*, lxxxiv, 5, pp. 67–68, 2 figs., 1938.

The use of ozone as a preventive of fungal and bacterial rots of foodstuffs (especially fruit and vegetables) in cold storage [*R.A.M.*, xvii, p. 613] is stated to be giving very satisfactory results in Germany, while H. Kessler reports favourably on its efficacy in the control of decay in five out of seven apple varieties in Switzerland, the loss among Ontario apples, for instance, being reduced from 30 to 13 per cent.;

the condition of stored cherries was also improved by the gas. Particulars have been published (*Z. ges. Kälteindustr.*, 6, 1934) of experiments carried out by the writer and A. Heiling at the Vegetable and Fruit Storage Research Station, Kalbe (Germany), concerning the action of ozone on the growth and sporulation in the atmosphere of the ubiquitous *Penicillium glaucum*, which was inhibited to an average extent of 63 per cent. by the treatment. No adverse effects in the form of undue acceleration of maturity of fruit through ozonization have been observed.

Since the free oxygen atom of ozone rapidly combines with other substances, fresh supplies of the gas must be introduced into the storage room at frequent intervals; in practice it is commonly put into operation two or three times daily for periods of half an hour to an hour, the quantities liberated being measured by iodometric or colorimetric methods or by means of a gasometer.

MITTMANN (GERTRUD). **Infektionsversuche an Obstbäumen mit Stämmen verschiedener Herkunft von Monilia cinerea und Monilia fructigena.** [Inoculation experiments on fruit trees with strains of various origin of *Monilia cinerea* and *Monilia fructigena*.]—*Z. PflKrankh.*, xlviii, 5, pp. 232–246, 9 figs., 1938.

Young trees of different varieties of sweet and sour cherry, peach, pear, and apple were subjected to blossom and twig inoculations with 23 strains of diverse origin of *Monilia cinerea* [*Sclerotinia laxa*: *R.A.M.*, xvii, p. 536] and *M.* [*S.*] *fructigena*. Successful results were obtained with conidia both from naturally occurring 'cushions' and from malt agar cultures, but not with the microconidia developing profusely in the latter.

The highest incidence of infection on cherry blossoms was secured with three strains of *S. laxa* from sour cherry, shade Morello, and plum, respectively, and one of *S. fructigena* from apple. The sour cherry strain of *S. laxa* also infected peach blossoms (10 positive results out of 29), while that from shade Morello attacked an early plum in one test out of seven, and the Le Lectier pear in two out of six. The twig series of inoculations were effective only in the case of *S. laxa* on cherries, and preliminary wounding was essential to secure the entry of the fungus. A flow of gum was exuded from the site of invasion, the portion above which withered and died. Twig inoculations with *S. fructigena* gave uniformly negative results.

VYUNOFF (S. F.), FRIEDRICHSOHN (G. A.), & VERTOGRADOVA (Mme O. N.). Болезни плодовых растений (хлороз и черный рак) [Fruit crop diseases (chlorosis and black canker).]—87 pp., 9 figs., 1 diag., Саратов. плодоягод. опыт. Ст. [Saratoff Fruit Exp. Sta.], 1938.

The first part of this book (pp. 3–56) comprises an account by S. F. Vyunoff of his studies on the lime-induced chlorosis [*R.A.M.*, ix, p. 43; x, p. 676; xvii, p. 472] of apple, plum, raspberry, *Acer tartaricum*, *Syringa vulgaris*, and *Caragana arborescens* in the Saratoff Region of the U.S.S.R. The disease affects fruit trees mainly in the south and south-east of the Union and is attributed to insufficient intake of iron. Control measures

recommended are the introduction of iron salts and sulphuric acid into the soil, the planting of resistant varieties, and the avoidance of alkaline fertilizers. *Convolvulus arvensis* can be used as an indicator plant.

In the second part (pp. 57–86) G. A. Friedrichsohn and Mme O. N. Vertogradova describe the results of their field and laboratory investigations on the black canker of apple and pear, caused by *Sphaeropsis malorum* Peck [*Physalospora obtusa*: ibid., xvii, p. 46]. The disease occurs in the Saratoff Region on both old and young trees in the form of a leaf spot, fruit rot, and bark necrosis. The last-named is the most prevalent and harmful form, attacking weak trees intensively, and developing mostly through wounds, especially cracking of the bark on the south and south-west side of the trees. On rare occasions bark necrosis was caused by *Coniothyrium piricola* [*C. tirolense*: ibid., xvii, p. 187], while *Cytospora capitata* [ibid., xi, p. 745], *Phoma* [*Ascochyta*] *pirina* [ibid., xvi, p. 106], and *Schizophyllum alneum* [*S. commune*: ibid., xvii, p. 46] were sometimes present as secondary invaders. The main period of infection by *Physalospora obtusa* extended from the beginning of spring to the end of autumn, and the incubation period varied between 15 and 21 days from April to mid-August and between 25 and 27 days from mid-August to October. Resistance tests showed that although the local varieties of apples varied in their susceptibility to the disease, none of them was entirely resistant. Watering the orchards at a rate of 400 cu. m. per hect., repeated three times, arrested the development of the infection. Satisfactory control was obtained by scraping the wounds, disinfecting them with 5 per cent. iron sulphate, 1 per cent. copper sulphate, or 3 per cent. sodium fluoride, and subsequently applying an oil paint, and by spraying with Bordeaux mixture in summer or with iron sulphate (6 or 8 per cent.) in early spring or late autumn.

Wormald (H.) & Harris (R. V.). **Notes on plant diseases in 1937.**— *Rep. E. Malling Res. Sta., 1937*, pp. 181–186, 1938.

These notes on plant diseases investigated at East Malling in 1937 [*R.A.M.*, xvi, p. 756] contain the following items of interest. A disease seen on Newton Wonder apples received from Buckinghamshire, characterized by irregular sunken areas, dark green blotched with brown, confined to the eye end of the fruit, and more conspicuous than ordinary bitter pit, was identified by H. Hill as blotchy pit. A disease thought to be a form of bitter pit occurred on pears, which showed a deeper pitting than apples and were often deeply dimpled and very irregular in shape. Many of the raspberry canes on the plantations of the Lloyd George variety at the Research Station exhibited during the early spring severe symptoms of 'dwarf-lateral scorch', but recovered later on and yielded a heavy crop. In similar cases observed on heavier soils of the Kentish Weald the subnormal development of laterals persisted and the crop was adversely affected. A relatively high mean temperature during the dormant period was experimentally shown to be a primary cause of the disease, but the observed natural recovery indicates that other factors are involved as well. Leaf blotch was unusually prevalent on hawthorn [*Crataegus oxyacantha*] in 1937, the causal fungus, *Sclerotinia cydoniae* [cf. ibid., xii, p. 488], being so far as is known confined to this host,

though the quince and the medlar have each a leaf-blotch fungus. *Verticillium dahliae* was found to produce a wilt of the Huxley's Giant and the Royal Sovereign varieties of strawberries [cf. ibid., xiii, p. 454], causing the outer and older leaves of well-grown plants to wilt and die shortly before cropping, while the petioles of the wilting leaves, the fruit stalks, and pedicels showed blue-black streaks and had a stringy and twisted appearance owing to the collapse of the cortical tissues. *Botrytis cinerea* was the chief fungal disease of strawberries during the year [ibid., xvi, p. 692]. *Stereum purpureum* was present on dead portions of walnut branches which had been cut back.

Moore (M. H.). **Field trials in 1937 of the fungicidal and phytocidal properties of certain sprays used against Apple scab. A progress report.**—*Rep. E. Malling Res. Sta., 1937*, pp. 229–235, 2 figs., 1938.

In spraying tests against *Venturia inaequalis* on apple [*R.A.M.*, xvii, p. 405] carried out in 1937 on 10-year-old bush trees of Worcester Pearmain, Allington Pippin, and Newton Wonder various weak sprays containing sulphur or copper were applied twice before and twice after blossom. Lime-sulphur, used at 1 per cent. by volume, gave good control of scab, causing slight leaf- and fruit-drop only in Newton Wonder. The application of lime-sulphur (1 per cent.) pre-blossom followed by sulsol (0·5 per cent. by weight) or tetramethylthiuram disulphide [loc. cit.] (0·02 per cent. by weight) post-blossom showed distinct promise, but the use of lime-sulphur produced poor skin finish on Allington Pippin. Indifferent control of scab, and severe spray damage in the form of leaf-burn, leaf-drop, and fruit russeting resulted from weak Bordeaux mixture (1–1½–100) and bouisol (0·167 per cent. by weight). The addition of washed cottonseed oil (0·75 per cent. by volume) to Bordeaux mixture (1–1½–100) improved the control and obviated leaf-burn and leaf-drop, but failed to prevent fruit russeting. A strong Bordeaux mixture (6–9–100) gave the best control, but caused severe injury. Of the three apple varieties tested, Allington Pippin was the most susceptible to scab, and Newton Wonder was the most resistant to injury by sprays containing copper.

Wellman (R. F.) & Heald (F. D.). **Steam sterilization of Apple boxes for blue mold.**—*Bull. Wash. St. agric. Exp. Sta.* 357, 15 pp., 1938.

In experiments on the effect of streaming steam on the spores of *Penicillium expansum* [*R.A.M.*, xvii, p. 505] known to be carried on apple picking boxes, the authors placed standardized suspensions of these spores on small blocks of apple box wood and exposed them to a stream of steam (either in an autoclave with the outlet valve fully open, in an Arnold sterilizer, or to direct steam over a flask of boiling water) for varying periods of time and then transferred the spores to 100 c.c. water, the colonies resulting from 1 c.c. of this suspension being taken as an index of efficiency of the treatment. Complete control was obtained by the first and third methods and almost complete control by the second method, after an exposure for one minute; an exposure for two minutes by the second method killed spores placed between two blocks of wood, simulating the joints of boxes. Spores dried for a fortnight were more readily killed than those dried for a few hours only, and

spores were more difficult to kill when mixed with decayed apple tissue. Since steam is available in most packing-houses, steam sterilization of old apple picking boxes, which are to be used again, is recommended for commercial practice, and an exposure to streaming steam for two minutes is considered sufficient to kill all spores of *P. expansum* present.

DEGMAN (E. S.), BATJER (L. P.), REGEIMBAL (L. O.), & MAGNESS (J. R.). **Further investigations on the use of boron for control of internal cork of Apples.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 165–168, 1938.

Applications of boron in the form of boric acid or borax (2/3 or 1 lb. per tree, respectively), in the late autumn or early spring, to the soil round the trunks of 18-year-old Black Ben Davis and 30-year-old Ben Davis apple trees in two orchards in West Virginia showing at least 80 per cent. internal cork [*R.A.M.*, xvii, p. 465] gave complete control of the disease, the treated trees averaging only 2 per cent. or less internal cork and a number being entirely unaffected. Injections of boric acid (3 gm. in each of 3 holes bored in the trunk) gave 0 to 40 per cent. cork in one orchard, apparently as a result of some of the vascular tissues supplying certain limbs being missed; when the injections were made in large limbs (3 gm. in each of 2 holes) effective control resulted. In both orchards the untreated control trees showed 58 to 100 per cent. cork.

Observations indicated that the disease is most prevalent in dry years and years of irregular rainfall. In the Shenandoah-Potomac fruit district internal cork is most severe on varieties of the Ben Davis group, including Gano, Black Ben Davis, and Ben Davis. It is common in Oldenburg and Yellow Transparent, and occurs occasionally in Rome Beauty, Grimes Golden, and Jonathan, but has not been found yet in Stayman Winesap, Delicious, or York Imperial. For the present, growers are recommended to make not more than one application of 1 lb. borax or 2/3 lb. boric acid per mature tree until the disease reappears.

BURRELL (A. B.). **Control of internal cork of Apple with boron.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 169–175, 2 figs., 1 map, 1938.

In further experiments in 1937 in New York on the control of internal cork of apples [see preceding abstract], approximately 4 gm. of boric acid crystals were introduced in September in each of four or five $\frac{7}{16}$-in. holes, $2\frac{3}{4}$-in. deep, in the crowns of 27-year-old Fameuse apple trees. Other trees received $\frac{1}{2}$ and 1 lb. of fertilizer grade borax spread on the soil at the base in April. The injections (which are not recommended commercially) reduced internal cork from 36·45 per cent. to 0·22 per cent. (averages of 27 control and 27 treated trees). Soil applications at the rate of 1 lb. per tree reduced it from 13·4 per cent. to 0·06 per cent. (averages of 15 and 16 trees, respectively). The lighter soil applications reduced it from 24·99 to 0·1 per cent., approximately. Limited corroborative data were obtained from three other orchards.

Observations on about 15,000 apple trees commercially treated with soil applications of borax of from $\frac{1}{4}$ to 1 lb. per tree showed no foliage injury from the applications. Injury was observed, however, in 6 out

of 36 non-thrifty 3-year-old trees treated with soil applications of ¼ lb. per tree, the symptoms comprising thin and tapering shoots, small leaves towards the shoot tip, leaf-rolling, marginal scorching, blanching, and shedding. Trees in which injections were made in autumn showed about twice as much bark injury as those in which the injections were made in spring. Marginal scorching of young leaves resulting from applications of borax in sprays (2 lb. per 100 gals.) was lessened or eliminated by the presence of lime or lime-sulphur.

SMOCK (R. M.) & VAN DOREN (A.). **The histology of bitter pit in Apples.** —*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 176–179, 3 figs., 1938.

In a study of the anatomical characteristics of bitter pit [*R.A.M.*, xvi, pp. 688, 820; xvii, p. 399] in Baldwin, Northern Spy, McIntosh, and Gravenstein apples the condition was first noted in groups of cells from which starch had not disappeared, but these cell groups could not be identified as pit areas until a few cell walls had collapsed. Starch may persist in such cell groups without subsequent pitting. In the early stages of pit development, starch was often seen in the surrounding healthy cells, as well as in affected ones.

When the cell protoplasm had become plasmolysed, and some of the walls had collapsed, discoloration of the cells was so pronounced that the bitter pit lesions were visible to the naked eye through the skin. As the pit developed, some but not all of the cell walls tore and broke down; in severely affected areas the collapsed walls formed bands binding cavities formerly occupied by four or more normal cells. Starch grains were always included between the collapsed cell walls, though the surrounding cells were starch-free. Starch persistence may, however, be concomitant with bitter pit, rather than the cause of it [cf. *R.A.M.*, vii, p. 102, *et passim*]. No thickening of the cell walls was observed. In the early stages, the epidermal and hypodermal region was unaffected; the hypodermal cells were not affected until the pitting had become very severe. When the skin had become depressed over the pitted area the hypodermal cells sometimes appeared slightly collapsed, with occasional tearing of the walls.

Pits in fruits on the tree were of the same type as those in stored fruits, storage pit being, apparently, only a delayed appearance of pitting in predisposed fruits. Contrary to McAlpine's views (Bitter pit investigations, 1911–16) no evidence was obtained that vascular bundles associated with the pits were less fully developed or in any way less normal than bundles in unaffected areas. Pits were always associated with vascular bundles.

Scald in Jonathan Apples.—*Fruit World, Melbourne*, xxxix, 5, p. 17, 1938.

Investigations conducted in Victoria during recent years established that apple scald [*R.A.M.*, xvii, pp. 399, 463, 464] may be bad in some seasons while in others under apparently the same storage conditions the disease may not appear. Two sets of factors are involved, viz., storage and pre-storage factors. Scald has been found to be definitely a low temperature disorder occurring mostly (80 per cent. affected in one experiment) at 32° F., slightly (20 per cent.) at 34°, and not at all above 36°.

It develops relatively quickly in cool storage, and apples which have not developed scald within two to three months of storage remain free from it even when further stored at 32°. It is, therefore, recommended to store Jonathans at 36° until the end of April, then at 34° till the end of May, and thereafter at 32°, thus ensuring a fresh condition of the fruit which would have suffered from continuous storage at 36°. Of the pre-storage factors affecting the development of the disorder, the main one is the maturity of the apples at picking time. Early picked Jonathans proved to be not very susceptible to scald, while fruit picked, in a normal year, towards the end of March, when it possesses maximum flavour, aroma, high colour, and a crisp and juicy flesh, was very susceptible. It was also found that a high temperature of the apple prior to storage greatly favoured the development of scald. Growers are advised, therefore, not to place warm Jonathan apples directly in the store, but to let them cool off overnight first, a procedure which would incidentally greatly lessen the task of the cool store engineer in cooling down the fruit to the usual storage temperatures.

MacDaniels (L. H.) & Hildebrand (E. M.). **Results of further studies on the effect of bactericides on pollen germination and fruit set.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 14–23, 1938.

Further studies [which are described, and the results of which are tabulated] carried out from 1934 to 1937, inclusive, in New York on the effect of bactericides applied to the open blossoms upon the set of apple fruits [*R.A.M.*, xvii, p. 607] showed no serious reduction in fruit set from the bactericides tested, especially Bordeaux mixture (1–3–50) and copper-lime dust (20–80), which were less detrimental than lime-sulphur and other sulphur compounds. Practically no fruit russeting or other serious foliage damage resulted from the experiments. Preliminary tests indicated that the effects on pear and quince will prove to be similar to those on apple.

Ridgway (H. W.). **A case of rosette on Apple in Virginia.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 227–229, 1 fig., 1938.

In 1933, a 13-year-old Golden Delicious apple tree in Virginia showed symptoms of rosette [little leaf: *R.A.M.*, xvii, p. 327], consisting of defoliation of the older leaves, small, narrow, chlorotic leaves at the tip of the new growth, spindling twigs with short internodes and narrow crotch angles, and reduction of fruit set on the affected branches. In April, 1935, 3 lb. commercial zinc sulphate was spread on the ground round the base of the trunk, and a month later a severely affected branch was sprayed with a mixture containing 8 lb. zinc sulphate, 8 lb. lime, 2 lb. lead arsenate, and 10 lb. flotation sulphur paste. As no marked improvement was noted, 4 holes $\frac{3}{4}$ in. wide and $1\frac{1}{2}$ in. deep were bored in a main branch in April, 1936, filled with commercial zinc sulphate, and plugged with wax. By 1937, the growth of this branch was almost normal, though the untreated branches showed typical symptoms. In 1936, the same condition was noted on another Golden Delicious tree and on *Liriodendron tulipifera* trees in the vicinity. This is the first report of zinc deficiency in apple districts in the United States east of the Rocky Mountains.

Davis (L. D.) & Moore (N. P.). **Black-end of Pears. V. Seasonal changes in P_H of the fruit.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 393–401, 6 graphs, 1938.

In further investigations on black end of Bartlett pears [*R.A.M.*, xvii, p. 297] in California a study was made of the seasonal changes in the P_H value of the calyx end, mid-section, and stem end of fruits from normal and affected trees, full data on which are given. Fruits from black-end trees were consistently more alkaline than those from normal trees throughout the season, but did not become markedly so until just before the rapid increase in the number of black-end fruits. This suggests a close relation between the two phenomena, occurring before the disease becomes visible.

Wormald (H.). **Two ornamental shrubs as hosts of the organism causing Plum bacterial canker.**—*Rep. E. Malling Res. Sta., 1937*, pp. 198–200, 3 figs., 1938.

Pseudomonas mors-prunorum, the organism causing bacterial canker of plum trees [*R.A.M.*, xvii, p. 13], was isolated from bacterial spots on the leaves and lesions on the shoots and stems of young almond trees from a nursery in Berkshire, and from a similar lesion on a stem of the purple-leaved plum (*Prunus pissardi*) received from Swanley Horticultural College, Kent. The portions of almond stems examined had dead tips and discoloured areas round the nodes, the leaves showed irregular blotches and roughly circular spots, 1 to 2 mm. in diameter, with a dark brown centre and a pale green zone surrounding it. The portion of the stem of *P. pissardi* examined had a discoloured bark and was girdled by a canker. Inoculations of Victoria plum trees with bacterial strains from *P. pissardi* and from almond leaf and stem spots resulted in the development of cankers.

Wormald (H.) & Garner (R. J.). **Manurial trial on nursery trees with reference to effect on Plum bacterial canker.**—*Rep. E. Malling Res. Sta., 1937*, pp. 194–197, 1938.

In experiments carried out at East Malling from 1932 to 1936 young plum trees were treated with various fertilizers and then inoculated with *Pseudomonas mors-prunorum* [see preceding abstract]. None of the manurial treatments reduced susceptibility to the organism to any appreciable extent, and there was some indication that applications of lime may even increase it.

Rada (G. G.). **La enfermedad del 'mildiú' u 'Oidium' del Melocotonero en Arequipa.** [The 'mildew' or 'Oidium' disease of the Peach in Arequipa.]—*Inf. Estac. Agric., Lima*, 45, 9 pp., 12 figs., 1938.

Peach trees in the Arequipa Department, Peru, are stated to have sustained heavy damage since 1933 from mildew (*Sphaerotheca pannosa*) [*R.A.M.*, xvi, pp. 21, 474; xvii, p. 589], other local hosts of which include yellow plums, nectarines, and roses.

Dunbar (C. O.) & Anthony (R. D.). **Two cases of potassium deficiency in Peach orchards in South Central Pennsylvania.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 320–325, 4 figs., 1938.

In June, 1937, approximately one-third of a number of 7-year-old

Elberta peach trees in an orchard in Pennsylvania failed to crop; the leaves were pale olive-green, and showed edges bordered with red, but marginal disintegration was only occasionally found. Nearly all the leaves were crinkled along the midrib, and laterally rolled towards it, forming a cylinder in extreme cases, with the under surface of the leaf exposed and revealing considerable light red to pink discoloration. Terminal growth was of almost normal length, but very slender. Chemical analysis of the affected leaves showed them to be low in potassium and nitrogen. Applications of potash fertilizers (3 lb. nitrate or sulphate of potash per tree) remedied the disorder, whereas no other treatment was efficacious. In another locality the same condition responded satisfactorily to applications of potash.

Cation (D.) & Robertson (C. W.). **Basi cop as a Cherry spray.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xx, 4, pp. 199–210, 4 figs., 1 graph, 1938.

In one year's comparative spraying tests against cherry leaf spot (*Coccomyces hiemalis*) carried out in Michigan [*R.A.M.*, xvi, p. 544], basicop (a powdered form of basic copper sulphate, the formula of which is given as $CuSO_4 2Cu(OH)_2$), used with lime (3–8–100), gave satisfactory control with little visible injury [ibid., xvii, p. 608]. When 1 lb. or less of lime was used, basicop in some cases caused copper injury, while when used alone ($1\frac{1}{2}$–100) it failed to give satisfactory control, though much superior to liquid lime-sulphur ($2\frac{1}{2}$–100). Bordeaux mixture (3–4–100 and 6–8–100) gave satisfactory control, but tended to dwarf the fruit in proportion to the concentration used; in one experiment, however, two pre-harvest applications at a strength of 4–5–100 did not cause fruit-dwarfing.

Harris (R. V.). **A bibliographical note on the distinction between mild and severe Strawberry crinkle.**—*Rep. E. Malling Res. Sta., 1937*, pp. 201–202, 1938.

Summing up present knowledge on the crinkle disease of strawberries [*R.A.M.*, xvi, p. 762] the author states that mild crinkle, first differentiated by Zeller in the United States [ibid., xiii, p. 313] from a possibly separable component of crinkle causing more severe symptoms, corresponds with the disease recognized by Ogilvie, Swarbrick, and Thompson [ibid., xiii, p. 642] in England in 1934 and found later at East Malling by Harris [ibid., xvi, p. 762]. The available data indicate that there is a definite etiological distinction between the two forms of crinkle, the precise nature of which remains to be determined. Mild crinkle was observed to be widely distributed in England in areas where severe crinkle was comparatively rare, and Massee (on p. 98 of this report) has shown that the aphis *Capitophorus fragariae* Theob. is the vector of the former. The author suggests that severe crinkle is either due to a virus which can act independently of the mild crinkle virus, or to one which causes the symptoms of severe crinkle in the presence of the mild crinkle virus.

Plakidas (A. G.). **The mode of action of Bordeaux on Mycosphaerella fragariae.**—*Phytopathology*, xxviii, 5, pp. 307–329, 1 fig., 1 diag., 1938.

A detailed, tabulated account is given of studies at the Louisiana

Agricultural Experiment Station to determine the mode of action of Bordeaux mixture on strawberry leaf spot (*Mycosphaerella fragariae*) [*R.A.M.*, xvii, p. 402].

The fungicide was shown to be without influence on the development of the mycelium within the host tissue, but it exercised a strongly inhibitive action on sporulation on the upper surface of infected foliage, between 7 and 10 times as many conidia being counted on unsprayed as on treated leaves. The conidia of *M. fragariae* were found to be extremely sensitive to copper toxicity. In direct contact with freshly prepared 4–4–50 Bordeaux mixture, germination was completely inhibited by as high a dilution as 1 in 1,000, while even at 1 in 10,000 and 1 in 20,000 a certain degree of toxicity was apparent. No germination occurred, moreover, among conidia placed in contact with Bordeaux dried and aged on glass slides for periods ranging from a week to over a year, or weathered on leaves in the field for 50 days. The ungerminated spores appeared from their coagulated protoplasm to be dead at the end of 24 hours, while exposure of aqueous suspensions of conidia for the same period to contact with the mixture on leaves sprayed ten days earlier was also lethal. The conidia failed to germinate in the supernatant clear liquid of fresh 4–4–50 Bordeaux; in the supernatant liquid of the fungicide dried on glass the germ-tubes assumed abnormal shapes. Separation of the conidia from the mixture by a partition of filter paper did not prevent their destruction or permanent injury by exposures of 30 minutes or longer, no germination ensuing on their removal from the sphere of influence of the fungicide and washing. When the spore suspension was connected with dry Bordeaux smears on glass slides by means of narrow water bridges, no germination occurred at distances of 1, 2, or 3 mm., while at 5, 10, and 16 mm. the process was initiated but soon ceased. Solutions of 1 in 250,000 copper sulphate, 1 in 500,000 copper chloride, and 1 in 400,000 copper acetate were lethal to the ungerminated conidia. At higher dilutions, e.g., 1 in 500,000 to 1 in 1,000,000 copper sulphate only rudimentary germination took place; at 1 in 4,000,000 the process was normal. Lime proved to be non-toxic.

It is concluded that the action of Bordeaux mixture on *M. fragariae* is mainly eradicative in character.

Simmonds (J. H.). **Alternaria passiflorae n.sp., the causal organism of brown spot of the Passion Vine.**—*Proc. roy. Soc. Qd*, xlix, 13, pp. 150–151, 1 pl., 1938.

The *Alternaria* causing brown spot of passion fruit (*Passiflora edulis*) and also affecting *P. alba*, *P. quadrangularis*, *P. herbertiana*, and *P. incarnata* in Australia [*R.A.M.*, x, p. 394; xv, p. 593] is now named *A. passiflorae* n.sp. [with a Latin diagnosis]. The conidiophores are solitary or caespitose, brown, hyaline towards the apex, simple or rarely branched, sparsely geniculate, bearing conidia singly or, in culture, in chains averaging 2·5 individuals. The conidia are oblong, brown, with 5 to 13 (average 8·7) transverse septa and few or no longitudinal septa (average 2·5), frequently bear a beak 3 to 4μ broad, simple or with 1 to 5 branches, and flexuous towards the base in culture, and measuring

without the beak 44 to 135 by 14 to 27μ, averaging 83 by 20μ, or with the beak 106 to 253μ long.

HEINICKE (A. J.). **How lime sulphur spray affects the photosynthesis of an entire ten-year-old Apple tree.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 256–259, 1938.

When a 10-year-old Baldwin apple tree pruned on 14th June, 1937, and placed in a specially constructed glass assimilation chamber was sprayed with lime-sulphur (1 in 40) on the night of 6th–7th July, another pruned tree being kept in a similar chamber, unsprayed, as a control, during the five days following the first spray application the foliage of the treated tree was only about one-half as active as it had been during the preceding six days, while the control tree showed a slight increase in the average daily rate of photosynthesis [*R.A.M.*, xv, p. 727]. The reduction due to the spray in this 5-day period alone represented a loss of dry matter equivalent to that found in about half a bushel of mature apples. Slight burning of the leaf margins, involving not over 5 per cent. of the total leaf area, occurred on the second day after spraying. Within 15 days from the date of the first spraying the tree had apparently recovered, and new, unsprayed leaf had appeared. After the second spraying, on the night of 21st–22nd July, there was again an appreciable reduction in photosynthetic activity during the ensuing 5 days, though, with reference to the control, less marked than after the first spraying.

The data indicated that reduction in photosynthetic activity following lime-sulphur spraying is especially severe if the mean temperature is high during the week following the application. The small amount of burning noted was not alone enough to account for the reduction, photosynthesis being evidently influenced by the spraying in such a manner that the rate of assimilation of unscorched leaf surface was reduced.

These results are not considered to warrant the view that lime-sulphur should be discarded as a fungicidal spray, but in cases where fungal diseases can be controlled by milder sprays, such as wettable sulphurs, cumulative benefits may be expected from their use, resulting from the greater photosynthetic activity of the leaf surface.

KEARNS (H. G. H.), MARSH (R. W.), & MARTIN (H.). **Combined washes. Progress report. IV. The phytocidal properties of petroleum oil sprays alone and in combination with lime-sulphur.**—*Rep. agric. hort. Res. Sta. Bristol, 1937*, pp. 65–77, [1938].

Further extensive field trials with combined insecticidal-fungicidal sprays carried out in 1937 at Long Ashton and elsewhere [*R.A.M.*, xvi, p. 817] again demonstrated that a combined wash of a grade G petroleum oil-sulphite lye emulsion, lime-sulphur, and nicotine may safely be applied to all apple varieties tolerant of sulphur. The addition of the petroleum oil emulsion to a petal fall lime-sulphur wash did not reduce the control of scab [*Venturia inaequalis*] as compared with that given by a lime-sulphur-sulphonated lorol mixture of the same lime-sulphur content, but may have reduced the number of apples picked.

PORGES (N.). **A fungus in acid copper plating baths.**—*Metal Ind., N.Y.*, xxxvi, 1, pp. 19–20, 1938.

The writer records the occurrence, hitherto apparently unknown, of a fungus forming medusa-like colonies, up to ½ in. in diameter, in an acid copper-plating bath containing 6·8 per cent. sulphuric acid and copper sulphate to saturation. The fungal particles moved with the current, adhered to the metal, and became covered with copper; on removal from the bath they were rubbed off by the burnisher, leaving bare spots on the plated object. Pure cultures of the organism were found to make very slight growth on Czapek's solution with the addition of copper sulphate, whereas profuse development occurred on Czapek's solution plus sulphuric acid but no copper. Tap water was commonly used for the baths, and the fungus, when grown in this medium with the addition of 3 per cent. sugar, formed the typical medusa-like growths observed in the original bath liquor. The identity of the fungus is still under investigation.

TABORDA DE MORAIS (A.). **Notice sur le dépérissement de la Zostera marina L. au Portugal.** [A note on the dying-off of *Zostera marina* L. in Portugal.]—*Bol. Soc. broteriana*, Sér. II, xii, pp. 221–223, 1937. [Received August, 1938.]

Attention is drawn to the occurrence on the banks of the Ria de Aveiro lagoon, on the west coast of Portugal, of the wasting disease of *Zostera marina* [*R.A.M.*, xvii, p. 543]. Since the first destructive onset of the malady in 1931–2 [ibid., xii, p. 712], the grass-wrack has made no fresh growth, and the consequent loss of this valuable manure imposes considerable hardship on the local peasantry.

PORTER (C. L.) & CARTER (J. C.). **Competition among fungi.**—*Bot. Rev.*, iv, 4, pp. 165–182, 1938.

This is an up-to-date review of the literature [181 titles of which are cited in the bibliography appended] dealing with the competition of fungi among themselves and with other micro-organisms, some aspects of which have been noticed from time to time in this *Review*.

DUSSEAU (ALINE). **Premières cultures de champignons sur cellophane.** [First cultures of fungi on cellophane.]—*C.R. Acad. Sci., Paris*, ccvi, 22, pp. 1672–1673, 1938.

The author has obtained satisfactory cultures of various species of *Fusarium*, *Aspergillus*, and *Penicillium* on sheets of cellophane (cellulose acetate), which affords a convenient substitute for filter paper as the sole source of carbon. Pigmentation, notably in *F. arthrosporioides* [*R.A.M.*, xi, pp. 17, 745] and *F. sambucinum* [ibid., xvi, p. 434; xvii, p. 168], develops more rapidly on cellophane than on filter paper, while the transparency of the former substratum facilitates observation and photography.

WYCKOFF (R. W. G.). **Le poids moléculaire des virus-protéines des plantes.** [The molecular weight of the virus proteins of plants.]—*C.R. Soc. Biol., Paris*, cxxviii, 14, p. 1396, 1938.

The data herein presented on the molecular weights of certain plant virus proteins have mostly been published and noticed in this *Review*.

Mostafa (M. A.). **Mycorrhiza in Tropaeolum majus L. and Phlox drummondii Hook.**—*Ann. Bot., Lond.*, N.S., ii, 6, pp. 481–490, 7 figs., 1938.

Tropaeolum majus and *Phlox drummondii* roots in the Zaafran Palace Garden, Cairo, were found to contain an endophytic fungus. In *T. majus* the well-developed endotrophic mycorrhiza with vesicles and arbuscules [of the common Phycomycetoid endophyte type: *R.A.M.*, xvi, pp. 47, 621, 822; cf. ibid., xvii, p. 263] was present. In *P. drummondii* the endophyte is generally similar to the foregoing, but intracellular hyphal clumps are usually formed in addition to the arbuscules, and vesicles are rarely encountered, the few that are formed showing occasional transverse septa. From young roots of *T. majus* disinfected in mercuric chloride 1 in 1,000 for from 30 seconds up to 2 minutes the author isolated a sterile septate mycelium, and inoculations of sterilized seeds with it in sand and agar cultures resulted in earlier germination; sections of the roots of inoculated seedlings were found to contain the fungus and its arbuscules. A sterile mycelium was also isolated from the roots of *P. drummondii*, but seed inoculated with it revealed no trace of a fungus. The endophyte under discussion is regarded as belonging to the *mycelia sterilia*.

Miller (F. J.). **The influence of mycorrhizae on the growth of Shortleaf Pine seedlings.**—*J. For.*, xxxvi, 5, pp. 526–527, 1938.

An experiment was carried out on old farmland in Missouri in 1937 to determine the influence of mycorrhiza on the growth of shortleaf pine [*Pinus echinata*] seedlings. Three plots were laid down, of which (1) had been planted with shortleaf pine in 1935 and cowpeas in 1936, (2) with shortleaf pine in 1935 and hardwoods in 1936, and (3) with shortleaf pine in 1935 and transplants of the same species in 1936. On 13th September the average root length of the seedlings in plots (1), (2), and (3) was 4, 5, and 6 to 8 in., respectively, and the number of laterals 8, 10, and 10 to 12, respectively; mycorrhiza were absent in (1), sparsely present in (2), and abundant in (3). On old farm soil, therefore, mycorrhiza are evidently essential to the vigorous development of *P. echinata* and should be introduced on transplants, which bear a sufficient number to maintain thriving growth. A further point to be borne in mind is the necessity of building up the organic matter in such soils to a point approaching natural forest conditions, so that the mycorrhiza have something to grow on during the fallow year. For this purpose a desirable succession is a soiling crop the first year, pine transplants the second, shortleaf pine seedlings the third, and so on.

Nisikado (Y.), Hirata (K.), & Higuti (T.). **Studies on the temperature relations to the longevity of pure culture of various fungi, pathogenic to plants.**—*Ber. Ōhara Inst.*, viii, 2, pp. 107–124, 4 graphs, 1938.

In further studies at Kurashiki, Okayama, Japan, on the influence of temperature on fungal longevity [*R.A.M.*, xvii, p. 128] test-tube cultures were kept at temperatures of 0°, 5°, 10°, 15°, 20°, 25°, 30°,

and 35° C., and the viability tested at monthly intervals. The following organisms survived 34 months (the maximum duration of the experiments) on steamed rice straw at all temperatures from 0° to 20° inclusive: *Hypochnus centrifugus* [*Corticium centrifugum*] from Dutch iris, *H.* [*C.*] *sasakii* from wheat, *Gibberella fujikuroi* from rice, *Ophiobolus miyabeanus* from rice, *Pyrenophora graminea* [*Helminthosporium gramineum*] from barley, *Fusarium niveum* [*Calonectria graminicola*], *H. nodulosum* from *Eleusine indica* [cf. ibid., xv, p. 426], and *Macrosporium* [*Alternaria*] *porri* from onion [see above, p. 654]; from 0° to 15°: *G. saubinetii* from barley and *Sclerotinia trifoliorum* from *Astragalus sinicus*; from 0° to 10°: *Ceratostomella piceae* from blue-stained sapwood of *Kalopanax* [*Acanthopanax*] *ricinifolium*, *C. pini* from similar material of *Pinus densiflora*, *Cephalosporium gramineum* from wheat [ibid., xvii, p. 593], and *Cercospora kaki* from persimmon; and from 0° to 5°: *Ceratostomella ips*. At 30°, *G. fujikuroi*, *O. miyabeanus*, and *H. nodulosum* were viable for 28 to 29 months, *Corticium sasakii*, *A. porri*, and *Septoria lactucae* from lettuce for 11 to 16, and the other species tested for only 3 to 5 months. At 35° none of the fungi under observation survived for more than 5 months, except *H. nodulosum*, which was still alive after 16.

The temperature relations of *Piricularia oryzae* from rice approximated to those of most of the other test organisms in respect of heat, but were quite different as regards reaction to cold, the survival periods being only 1 to 2 months at 0° and 3 to 4 at 5°. *P. zingiberi* from *Zingiber mioga*, on the other hand, remained viable for at least 8 months at 0°. *Phytophthora melongenae* [*P. parasitica*: ibid., xv, p. 633] from egg-plant reacted similarly to *Piricularia oryzae*, withstanding temperatures of 0°, 5°, 10°, 15°, 20°, 25°, 30°, and 35°, for 2, 2, 12, 12, 9, 7, 3 months, and less than 1 month, respectively.

Ehrke (G.). **Die Kartoffelbeizung in Hinblick auf die Bekämpfung der Rhizoctonia und des Kartoffelschorfes.** [Potato disinfection in relation to the control of *Rhizoctonia* and Potato scab.]—*Pflanzenbau*, xiv, 11, p. 426–440, 1938.

Following a discussion on the advantages of disinfection of potato tubers against *Rhizoctonia* [*Corticium solani*] and scab [*Actinomyces scabies*], much of which has already been noticed from another source [*R.A.M.*, xvii, p. 481], the author describes an experiment on the treatment of potato tubers with aretan (0·15 per cent. for 25 minutes) [ibid., xvii, p. 586]. The treatment reduced the amount of scabbed potatoes from 5 kg. per 50 kg. in the control to 2 kg. per 50 kg. and increased the yield by 6·3 per cent., but did not give appreciable control of *C. solani*; fewer large tubers and more medium-sized and small potatoes were produced by the treated seed than by the control. Treatment with mercuric chloride resulted in 0·5 kg. scabbed potatoes per 50 kg. and gave good control of *C. solani*, but it reduced the yield by 4·5 per cent. Admitting the beneficial effect of tuber disinfection the author points out that it affects only the parasite attached to the surface of the tubers and that a method dealing with soil infestation as well would be more effective. He suggests that a desirable solution would be the preparation of a fertilizer with the addition of either inorganic

mercury compounds or of other substances equally effective in control of the two diseases.

LEPIK (E.). **Beitrag zur Beizung der Pflanzkartoffeln.** [A contribution to seed Potato disinfection.]—*Mitt. phytopath. VersSta. Univ. Tartu*, 49, 6 pp., [?1938. Received July, 1938.]

A brief summary is given of some outstanding contributions to the improvement of seed potato disinfection in Europe and the United States, followed by a note on preliminary experiments in 1936 in Estonia on the control of *Hypochnus* [*Corticium*] *solani* by 30 minutes' immersion in 0·10 per cent. mercuric chloride and 0·15 per cent. aretan [see preceding abstract]. The latter gave the better results, producing an average of 15·6 tubers for 30 plants compared with 13·1 and 11·6 for the mercuric chloride-treated and control series, respectively, while the numbers of completely healthy tubers in the aretan- and mercuric chloride-treated and control plots were 155, 106, and 6·3, respectively.

LEACH (J. G.). **The biological basis for certification of seed Potatoes.**—*Amer. Potato J.*, xv, 5, pp. 117–130, 1938.

Following an explanatory statement concerning the main objective of seed potato certification [see next abstract], namely, the production for distribution of supplies of tubers combining adherence to variety and type with freedom from disease, the writer summarizes the relevant information on some of the disorders involved in the work, viz., viruses, scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium solani*], *Fusarium* wilts [*F. oxysporum* and *F. solani* var. *eumartii*: *R.A.M.*, xvii, p. 409], *Verticillium* wilt [*V. albo-atrum*], 'Z' disease [ibid., xvi, p. 708], blackleg [*Erwinia phytophthora*], late blight [*Phytophthora infestans*], bacterial wilt (*Phytomonas* [*Bacterium*] *solanacearum*), bacterial wilt and ring rot [ibid., xvi, p. 628], purple top wilt (probably identical with blue stem [ibid., xvii, pp. 480, 552]), and hair or spindling sprout [ibid., xvi, p. 118].

In connexion with the mode of transmission of blackleg, evidence is adduced from an unpublished manuscript by R. Bonde of the comparative unimportance of the seed in the perpetuation of this disease [ibid., xv, p. 483], the certification requirements in connexion with which should be amended in the light of recent information. Epidemics of blackleg are more likely to arise as a result of contamination by way of the soil, through fungal lesions, or from the infection of seed injured by the successive drying of freshly cut surfaces, unfavourable storage conditions, or infestation by certain insects than from the presence of a small number of diseased plants in the field producing the seed stock.

On account of its destructive character and ready transmission through infected tubers, no plants suffering from bacterial ring disease should be allowed in certified fields pending a more thorough study of the disease.

The course of purple top wilt indicates the possible implication of a toxicogenic insect as in the case of psyllid yellows [ibid., xiv, p. 117], but in the absence of more accurate information all seed certification regulations must necessarily be tentative.

Spindling (hair) sprout has only recently begun to occur in destructive amounts such as developed from many of the tubers grown in 1937, especially of the Triumph and White Rose varieties. A possible connexion between this disease and purple top wilt has been suggested, but the available evidence is inconclusive. Until further information is forthcoming a tolerance of 5 per cent. spindling sprout is advocated.

As regards the *Fusarium* wilts, a limit of tolerance based on stem-end discoloration rather than on bin inspection is recommended.

EDGERTON (C. W.). **Report of seed certification conference.**—*Amer. Potato J.*, xv, 5, pp. 130–140, 1938.

Among the numerous items of interest in the reports of the various committees presented at a conference to discuss problems relating to seed potato certification [see preceding abstract] held at Baton Rouge, Louisiana, from 5th to 8th April, 1938, the following may be mentioned. R. J. Haskell stated that up to 35 per cent. infection by bacterial ring disease [loc. cit] has been observed in Maine, with an average of 5 to 10 per cent. for certain areas. In Florida in 1937 the loss from the disease was estimated by Eddins at $100,000. All the commonly grown varieties, such as Spaulding, Rose, Katahdin, Triumph, and Green Mountain, are affected. Experiments in Florida have shown that 10 or 11 per cent. infected plants may be expected to develop from stock carrying 1 per cent. visibly diseased tubers.

Hair sprout [loc. cit.] can be detected, according to E. M. Gillig's report, only by germinating the tubers, necessitating the previous warming-up of a sufficient number of representative samples to give a fair idea of the percentage of the disorder.

The provisions of the joint report of the Regulations and Correlations Committees (presented by J. H. Montgomery) are cited; they include a tolerance limit (at time of shipment) of 5 per cent. each of hair sprout and net necrosis [*R.A.M.*, xvii, p. 478], 1 per cent. spindle tuber [ibid., xvi, pp. 487, 489], 4 per cent. *Fusarium* stem-end discoloration, and 1 per cent. *Sclerotium rolfsii* [ibid., xiii, p. 273].

MADER (E. O.) & WATKINS (T. C.). **Effects of Bordeaux mixture on the control of yellow dwarf Potatoes.**—*Phytopathology*, xxviii, 5, p. 375, 1938.

In experiments at Ithaca, New York, to determine the possibility of combating yellow dwarf of potatoes [*R.A.M.*, xvii, p. 478] by the suppression of the insect vector, *Aceratagallia sanguinolenta*, Bordeaux mixture was applied at various rates to the foliage at intervals during the 1936 season. After overwintering in storage the tubers were indexed for yellow dwarf in 1937, when it was found that only 14 out of 4,813 treated plants were diseased as compared with 64 out of 1,955 unsprayed. This reduction (from 3·3 to 0·3 per cent.) would be of importance in connexion with seed certification. There was no significant difference in the numbers of leafhoppers in the sprayed and control plots, and it is thought that the copper assimilated by the plants in the course of the treatment may render the virus partially or completely non-infectious.

HARVEY (R. B.). **The X-ray inspection of internal defects of fruit and vegetables.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 156–157, 1938.

During 1937, observations in Minnesota with a portable X-ray machine indicated that the incidence of hollow heart [*R.A.M.*, xv, p. 821; xvii, p. 410] in the locally grown potato varieties appeared to be greatest in Irish Cobbler, followed in descending order by Katahdin, Rural and Rural Russet, Burbank Russet, Green Mountain, Chippewa, Early Ohio, Bliss Triumph (in which no hollow heart was found), and Warba and Red Warba (which do not crack internally, but may show bad external cracks). The splits are oriented with the direction of cleavage in the medulla along visible lines where cell walls run parallel, and in Irish Cobbler radiating from the centre. In Burbank Russet and Early Ohio clefts tend to form across the tuber, and in long potatoes two or three transverse clefts may sometimes be joined together by a longitudinal cleft through almost the entire length of the medulla.

By examining every tuber in a few 100 lb. bags of Irish Cobbler potatoes hollow heart incidence in one truck-load was found to range from 27 to 37 per cent. A large sample of several hundred pounds must therefore be examined to form a true idea of the percentage of tubers affected in any lot, making grading by cutting open impracticable. The solution of the problem lies in X-ray inspection, by which about 7,500 lb. per hour can be sorted with one machine. Clefts in potatoes can be seen by X-rays through 1 ft. peat, 6 in. loam, or 3 in. sand, using high voltages on the portable machine. Potatoes may therefore be examined while still growing in the soil, if a suitable observation trough is used.

In Irish Cobbler potatoes hollow heart appeared to be most prevalent in light sandy soil, followed in descending order by clay loam, gumbo, sandy shallow peat, and deep peat. Incidence appears to be higher in northern than in southern Minnesota.

Unpublished data by F. Johnston indicate that defects and functional diseases in apples can also be detected by X-rays. The same methods have also been applied to the citrus fruits [ibid., xvi, p. 668] which can be sorted at the rate of 75 to 150 boxes per hour by this means.

SMERDON (R.). **A simple method of sulphur dusting.**—*Trop. Agriculturist*, xc, 5, pp. 274–275, 1938.

A simple method of applying sulphur dust [to *Hevea* rubber against *Oidium heveae*], which would appear to solve the problem of dusting small-holdings whose proprietors cannot afford to purchase machinery, consists in loosely filling small bags made of old sacking with 2 or 3 lb. sulphur and tying them, top and bottom, to the ends of poles about 25 ft. high, the pole then being agitated while held in a perpendicular position, and a cloud of sulphur being liberated over the tree. It is stated that Sinhalese labourers [in Ceylon] become very expert at liberating the required amount and in suitable weather conditions four men can easily dust 100 acres in one day, extra labour being required for transport.

STEVENSON (J. A.). **A note on Hop anthracnose.**—*Plant Dis. Reptr*, xxii, 8, pp. 125–126, 1938. [Mimeographed.]

A specimen of hops found at Argonne, Wisconsin, was characterized

by numerous amphigenous lesions on the leaf blades and petioles, sometimes bounded by the veins, but often arranged along them. The circular, later angular to irregular, dull light-brown to ashen spots measured 1 to 2 mm. in diameter, sometimes coalesced, had raised margins on both surfaces, and sometimes became perforated at the centre. The older portions of the spots showed the presence of pink, later faded, acervuli, bearing straight, occasionally slightly curved, conidia, 7 to 18 by 3 to 5μ, identified as the conidial stage of *Glomerella cingulata*. Several specimens apparently of the same disease have been found in the Mycological Collections dating from 1890, while anthracnose due to a species of *Colletotrichum* was recorded on cultivated hops in New York State in 1923.

NEERGAARD (P.). **Mykologiske Notitser. 1.** [Mycological notes. 1.]—*Bot. Tidsskr.*, xliv, 3, pp. 359–362, 1938. [English summary.]

From a careful study of herbarium material of *Ascochyta lactucae* Rostr. [1882] on lettuce the writer concludes that this species is identical with *Septoria lactucae* Pass. [1879: *R.A.M.*, ix, p. 224] but not with *A. lactucae* Oud. [1901] as stated by J. Lind. (Danish Fungi as represented in the Herbarium of E. Rostrup, Copenhagen, 1913). Rostrup's Latin diagnosis (1894) of a new species of *Ascochyta*, *A. suberosa*, also found on lettuce stalks forming brown, elliptical, often confluent lesions, is here published for the first time. This species is characterized by pycnidia measuring 90 to 120μ in diameter and ovate to fusoid, continuous or uniseptate spores, 9 to 14 by 3 to 4μ (average 12·3 by 3·2μ). *A. suberosa* may possibly be identical with *Diplodina lactucae* (Oud.) Sacc. & Sydow (*A. lactucae* Oud.), which has uniseptate, oblong spores, rounded at both ends, measuring 12 to 15 by 3·5μ.

Phoma nemophilae n.sp., with cylindrical conidia, rounded at the ends, unicellular or rarely 1-septate, 4·5 to 9 by 1 to 2μ, was found on seeds and seedlings of *Nemophila insignis* and *N. atomaria* [*N. menziesii*] in Holland and Denmark.

The widespread pathogen of carrot seed hitherto known as *Alternaria radicina* [ibid., xvi, p. 438] is transferred to *Thyrospora* as *T. radicina* (M., D., & E.) n.comb. During the last three years 24 per cent. of the samples tested were found to be infected by this fungus. Paris Market carrot seed was observed in 1937 to be contaminated by *A. brassicae* (Berk.) var. *dauci* (Kühn) Bolle [ibid., xv, p. 769].

JØRSTAD (I.). **Adventive elementer og nytilgang på verter innenfor vår rustsoppflora.** [Adventive elements and new host accessions in our rust fungus flora.]—*Nyt Mag. Naturv.*, lxxviii, pp. 153–200, 1938. [English summary.]

Rust fungi which have been introduced into Norway, or which parasitize introduced hosts, are grouped as follows: (1) species of recent introduction, including *Puccinia asparagi* on asparagus and *Uromyces betae* on beet, both detected for the first time in 1937, *U. caryophyllinus* on carnations, in part of English or French origin (1921), and *Puccinia chrysanthemi* on chrysanthemums from England (1904); (2) species that cannot be regarded as indigenous, but the time of introduction of which is unknown, viz., *P. anomala* on barley and *P. porri* on

species of *Allium*; (3) collective species comprising both indigenous and introduced races, viz., *P. caricis*, including *P. pringsheimiana* on *Carex goodenowii* and various species of *Ribes*, and *P. coronata* [*P. lolii*], *P. glumarum*, *P. graminis*, *P. secalina*, and *P. triticina* on cereals; (4) indigenous species parasitizing introduced hosts, among them *Gymnosporangium clavariaeforme* on pear and various *Crataegus* spp. [*R.A.M.*, vii, p. 34; xvii, p. 535] and *Juniperus communis*, and *P. ribis* on red currants [ibid., xiii, p. 173], especially the widely cultivated Viking variety, and *Ribes schlechtendalii*.

Picbauer (R.). **Addenda ad floram Čechoslovakiae mycologicam. Pars VIII.** [Supplements to the mycological flora of Czechoslovakia. Part VIII.]—*Verh. naturf. Ver. Brünn, 1937*, lxix, pp. 29–45, 1938.

Of the large number of records included in this annotated supplement to the mycological flora of Czechoslovakia, the following may be mentioned: *Marssonina moravica* n.sp. [with a Latin diagnosis] forming small, olivaceous-brownish, globose to irregular spots mostly near the leaf tips of *Anemone ranunculoides*; *Peronospora meliloti* on *Melilotus alba*; and *Puccinia arrhenatheri* on barberry foliage.

Ranojević (N.). **Beitrag zur Pilzflora Mazedoniens.** [A contribution to the fungus flora of Macedonia.]—*Hedwigia*, lxxvii, 5–6, pp. 233–242, 1938.

This is an annotated list, collated from the author's posthumous records and prepared for publication by J. Jurišić, of 77 fungi, including a number of pathogens, collected in Macedonia (Bulgaria) between 1904 and 1913.

Zundel (G. L. I.). **The Ustilaginales of South Africa.**—*Bothalia*, iii, 3, pp. 283–330, 1938.

This critically annotated list of 117 Ustilaginales (and four doubtful species) collected or reported from the Union of South Africa and adjacent territories [*R.A.M.*, vi, p. 441] is stated in the author's preface to be a preliminary contribution to a monograph of the group, which it is hoped later to amplify and complete. Some general observations are made on the characterization of the smuts, their classification is discussed in the light of recent studies [all of which have been noticed in this *Review*], and a key to the genera found in the country and host and fungus indexes are furnished. The list contains three new species and a number of new combinations.

Doidge (E[thel] M.). **Some South African Fusaria.**—*Bothalia*, iii, 3, pp. 331–483, 4 pl., 48 figs., 1938.

This preliminary study of the genus *Fusarium* in South Africa is based on about 100 strains isolated in the course of studies on dry root rot of citrus, one of the principal causes of loss in orange orchards, another 300 originating in decaying citrus fruits in storage, and a large number obtained in the ordinary routine of examination or in investigations on wilt diseases of various plants. Altogether some 850 strains were studied, a small percentage of which, chiefly of the *Elegans* section, had to be discarded without identification owing to the difficulty of

securing adequate sporulation. The system of classification established by Wollenweber and Reinking [*R.A.M.*, xv, p. 321] is followed. Very detailed descriptions are given of the morphological and cultural features of the species, and the list is supplemented by keys to the sections and subsections of the genus, fungus and host indexes, and a bibliography of 63 titles.

GADD (C. H.). **Report of the Mycologist for 1937.**—*Bull. Tea Res. Inst. Ceylon* 18, pp. 20–27, 1938.

In 1937, the ratio of dying to apparently healthy but infected tea bushes removed from 13 new areas affected with *Poria* [*hypolateritia*: *R.A.M.*, xvi, p. 634] at St. Coombs, Ceylon, was 1 to 3·7, as against 1 to 2·6 in 1936. Far more diseased bushes are present in any *Poria* patch than is at first apparent, and the removal of dead and sickly bushes only can never completely eradicate infection. The area must be forked through deeply to make certain that no infected roots remain.

The failure to establish tea on old, infected sites has almost always been chiefly due to the presence of old roots in the soil, rather than to active disease on the perimeter of the area. It may, therefore, be possible where the 'piece-meal' method of treatment of diseased bushes on the perimeter is carried out to replant the main area with tea before completion of the treatment at the perimeter.

Further study of tea 'phloem necrosis' [ibid., xvi, p. 635] showed necrosis to be present in the stem cortex, and also in the petiole, midrib, and veins of the leaf, especially in curled leaves. In some cases, pronounced leaf curl was present with marked necrosis in the veins, but no necrosis was found in the root tissues; on other occasions, necrosis was markedly present in the root cortex, but absent from the leaf veins. Diagnosis of the disease remains uncertain until a relatively advanced stage has been reached; the best time for making a diagnosis is probably four or five months after pruning, when affected bushes show very little growth, and this is generally abnormal in character. The disease is so far known to occur only at high elevations, where shortage of food reserves is not a cause of delayed recovery from pruning, such delay in an affected area generally being associated with the disease. Pruning appears to expedite the development of diagnostic symptoms. No pathogenic organism has yet been found, and all attempts to transmit the disease by grafting, root fusions, and the injection of sap from affected plants have been unsuccessful.

The leaf fall of *Grevillea* [*robusta*] associated with a species of *Phyllosticta* [ibid., xvii, p. 205] persisted throughout the year on most estates, being most active after rains. It has now been reported from the Kalutara district and from one estate in the Nawalapitiya area situated at an altitude of 2,000 ft., the highest elevation yet recorded for the disease in Ceylon. Infection is at present confined to rubber-growing areas, not all of which, however, are affected. All the leaves shed during an attack bear irregular, dark, later grey spots; the discoloured area may cover the whole or the greater part of very young leaves. Inoculation tests demonstrated that these spots are due to the fungus, but it is not yet certain that the same organism also causes the leaf fall. The *Phyllosticta* is characterized by dark brown, globose, sometimes

flask-shaped, erumpent pycnidia 116 to 174μ in diameter, with a lighter ostiole, depressed in globose specimens, and measuring 14·5 to 17·4μ in diameter, and oblong, hyaline, non-septate spores with obtuse ends, measuring 3·9 to 6 by 1·8 to 3μ.

Crotalaria usaramoensis and *Tephrosia vogelii* affected by collar rot were found to have been attacked by *Cercosporella theae* [ibid., xvii, p. 138] at ground-level, with resultant death of the whole of the plants above the site of infection. The disease is most likely to occur under conditions which maintain high humidity at the soil-surface.

MANIL (P.). **Inactivation partiellement réversible, par $HgCl_2$, du virus appelé 'Tobacco necrosis'.** [The partially reversible inactivation, by $HgCl_2$, of the virus known as 'Tobacco necrosis'.]—*C.R. Soc. Biol., Paris*, cxxviii, 14, pp. 1464–1467, 1938.

Details are given of experiments conducted at the State Agricultural Institute, Gembloux, Belgium, to determine the effect of mercuric chloride on the infectivity of the virus of tobacco necrosis [*R.A.M.*, xvii, p. 562].

Juice from the diseased leaves, after dilution and centrifuging, was treated for one hour with varying concentrations of mercuric chloride, after which the mercury ion was precipitated by a slight excess of ammonium carbonate. Half an hour later the various liquids were diluted 1 in 10 and inoculated into beans [*Phaseolus vulgaris*].

In test No. 1, the infectious juice was distributed in six tubes (5 c.c. in each), one of which was left without further treatment, the second receiving 0·05 c.c. mercuric chloride, the third 0·3 c.c., the fourth 0·3 c.c. with subsequent precipitation of the mercury ion by 0·1 c.c. ammonium carbonate, the fifth as the preceding but using 0·4 c.c. ammonium carbonate, and the sixth consisting of the infectious juice with the admixture of 0·4 c.c. ammonium carbonate. The following numbers of lesions were obtained: (1) 210, (2) 184, (3) 9, (4) 215, (5) 91, (6) 273. In tests Nos. 2 and 3 a similar procedure was followed, but the concentrations of mercuric chloride were increased up to a maximum of 1 c.c. and those of ammonium carbonate to 1·2 c.c. The addition of 0·6 c.c. mercuric chloride reduced the number of lesions on the bean leaves from 330 to 6, with a subsequent rise to 116 after precipitation with 0·4 c.c. ammonium carbonate, while a dose of 1 c.c. entirely counteracted the infective principle and prevented the formation of any lesions in the inoculated plants, the virulence of the juice being partially restored, however, by 1·2 c.c. ammonium carbonate (31 lesions).

PETERSON (P. D.) & MCKINNEY (H. H.). **The influence of four mosaic diseases on the plastid pigments and chlorophyllase in Tobacco leaves.**—*Phytopathology*, xxviii, 5, pp. 329–342, 1938.

Using a method based on Willstätter's procedure for determining the chlorophyllase activities of plant tissues (*Plant Physiol.*, v, p. 257, 1930), involving comparisons of the 'green weights' of healthy and mosaic-diseased Wisconsin-Havana tobacco leaves, the writers found that the chlorophyll content of the samples affected by the common, yellow, mild dark green, and mild forms [*R.A.M.*, xvii, p. 631] was consistently lower than that of the sound ones (74·7, 43·3, 87·2, and

72·2 per cent., respectively, as against 100 per cent.). The drop in chlorophyll content in the infected leaves was found to be associated with an approximately proportionate fall in the yellow pigments, carotene and xanthophyll. Except in the case of common mosaic, the chlorophyllase activity of the ground leaf tissues of mosaic plants averaged appreciably higher than that of healthy tobacco (186·9, 118·5, and 125·3 per cent., respectively, for yellow, mild dark green, and mild mosaic as compared with 100 for sound material and 94·3 for that affected by common mosaic). A reduction of 50 per cent. in the chlorophyll content of yellow mosaic plants, as compared with healthy ones, is accompanied by an approximate doubling of the chlorophyllase activity of the ground foliar tissues. The yellow areas were found to be lower in chlorophyll but higher in chlorophyllase activity than the green ones. The chlorophyllase activity of healthy leaf tissues was found to be directly proportional to chlorophyll content, and the same was the case, though in a different ratio, with the leaf, stem, and root tissues of yellow mosaic plants.

FRAMPTON (V. L.) & NEURATH (H.). **An estimate of the relative dimensions and diffusion constant of the Tobacco mosaic virus protein.**—*Science*, N.S., lxxxvii, 2264, pp. 468–469, 1938.

The viscosity of solutions of the tobacco mosaic virus protein is stated to be proportional to the concentration of the virus up to concentrations of 1 per cent. Assuming the shape of a prolate spheroid for the virus protein particle a partial specific volume of 646, a particle weight of 17,000,000, a density of 1·55, and neglecting the factor of hydration, the authors used the Kühn equation in their calculations and obtained the value of 36·8 for the ratio of the long to short axis of the virus protein particle and the values of $3{\cdot}4\times10^{-7}$ and $1{\cdot}98\times10^{-5}$ cm. for the semi-minor and the semi-major axes of the particles, respectively. The diffusion constant of the virus was calculated from the viscosity data to have the value of $4{\cdot}5\times10^{-8}$, and the close agreement between the observed and calculated diffusion constants indicates that the protein is relatively hydrophobic.

LAUFFER (M. A.). **The molecular weight and shape of Tobacco mosaic virus protein.**—*Science*, N.S., lxxxvii, 2264, pp. 469–470, 1938.

By means of a high precision quartz viscometer the viscosities of very dilute aqueous solutions of tobacco mosaic virus protein were determined and the viscosity was found to be a linear function of concentration up to a concentration of 0·1 per cent. but the linearity does not hold for concentrations of 1 per cent. [see preceding abstract]. Calculating on the basis of Kühn's equation and assuming little or no hydration, the author obtained the value of 35·0 for the ratio of length to diameter of the cylindrical rod-shaped particles of the virus protein. A value of about $42{\cdot}5\times10^3$ was found for the molecular weight of the protein, corresponding to a particle 12·3$\mu\mu$ in diameter and 430$\mu\mu$ in length. It is emphasized that a better knowledge of the shape and state of hydration of the protein is necessary in order to interpret accurately the data from the ultracentrifuge.

HOLMES (F. O.). **Inheritance of resistance to Tobacco-mosaic disease in Browallia.**—*Phytopathology*, xxviii, 5, pp. 363–369, 2 figs., 1938.

Morphologically identical plants of *Browallia speciosa* var. *major* were found to fall into two categories closely resembling those already observed in *Capsicum frutescens* in respect of their reaction to infection by the tobacco mosaic virus [*R.A.M.*, xvi, pp. 711, 766], some permitting the systemic spread of the virus while others effectively localized it in the inoculated leaves. The systemic form of the disease was characterized in the early stages by chlorosis and retardation of growth, and subsequently by foliar and flower mottling and distortion. The localization of the infective principle in or near necrotic primary lesions was followed by the abscission of all the diseased leaves. Necrotic-type plants were found to possess a dominant gene N in a homozygous (NN) or heterozygous (Nn) condition, which was responsible for the development of the localized type of infection and did not occur in the plants affected by chlorosis (nn). The homozygous necrotic-type plants constitute a sub-variety capable of prompt recovery from tobacco mosaic, even after repeated inoculation.

RISCHKOV [RYJKOFF] (V. L.) & GROMYKO (E.P.). **A new method for the purification of the Tobacco mosaic virus.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xix, 3, pp. 203–205, 1938.

An account is given of a method which is claimed to allow of obtaining crystalline preparations of the virus of common tobacco mosaic much more rapidly than that of Loring and Stanley [*R.A.M.*, xvi, p. 498]. Briefly outlined, the method consists in freezing leaf and stalk material from diseased tobacco or tomato plants, after which it is twice extracted with a 0·1 molar solution of disodium hydrogen phosphate; the juice thus obtained is filtered through filter paper, and 1·5 to 2 gm. of sodium benzoate is added to 100 c.c. of the filtered juice. After thorough mixing normal hydrochloric acid is added until flakes of benzoic acid begin to appear. The precipitate is filtered and redissolved in a 0·1 molar solution of disodium hydrogen phosphate, and the resulting liquid is purified of pigments with carbolen (activated charcoal) without any considerable loss of the virus. This treatment yields a clear or slightly yellowish, opalescent liquid, from which the virus is crystallized by Stanley's method. To obtain permanent microscopic preparations a drop of the suspension of crystals in ammonium sulphate solution is spread on a glass slide and dried, fixed with a concentrated alcoholic solution of picric acid, carefully washed in water, stained with acid fuchsin, and mounted in Canada balsam. Inoculations with the crystalline material suspended in ammonium sulphate at a dilution of 1 in 100,000 produced a considerable number of necroses on *Nicotiana glutinosa* leaves.

BRAIN (C. K.). **Report of the Tobacco Research Board for the year ending December 31st, 1937.**—*Rhod. agric. J.*, xxxv, 5, pp. 350–378, 1938.

In the section of this report dealing with tobacco breeding (by A. A. Moffett) it is stated that when the tobacco varieties and hybrids

White Stem Orinoco, Jamaica Wrapper, Ambalema, Ambalema × White Stem Orinoco, and Ambalema × Jamaica Wrapper, planted in separate plots in several randomized blocks, were inoculated with mosaic [*R.A.M.*, xv, p. 704], Ambalema showed no infection, not even the slightest mottling, White Stem Orinoco and Jamaica Wrapper showed 100 per cent. infection and a very great decrease in yield, and the two F_1 hybrids showed 100 per cent. infection, but the plants grew out of the primary symptoms, became robust later on, and much of the mottling disappeared as the plants reached maturity. The leaf of the hybrids had a greenish cast similar to that of Ambalema but was much nearer to their other parents as regards body and texture.

Ternovsky (M. F.) & Khudyna (I. P.). Отношение гибридов **Nicotiana glutinosa L. × N. tabacum L.** к. обычной Табачной мозаике. Предварительное сообщение. [Reaction of *Nicotiana glutinosa* L. × *N. tabacum* L. hybrids to ordinary Tobacco mosaic. Preliminary report.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A.I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 135, pp. 69–70, 1938.

The annual losses from tobacco mosaic in the Azoff-Black Sea region are stated to amount to 3 to 5 per cent. In resistance trials in 1935 and 1936 no variety of *Nicotiana tabacum* was found to be immune from mosaic, but *N. glutinosa* developed necrotic lesions only in the region of inoculation (localized infection) and its leaves remained healthy and did not contain the virus. In breeding against tobacco mosaic [*R.A.M.*, xvii, p. 417 and next abstract] Ternovsky succeeded in 1932 in obtaining amphidiploids from the cross *N. glutinosa* × *N. tabacum* with 2 genoms of *N. glutinosa* (24 chromosomes) and 2 genoms of *N. tabacum* (48 chromosomes). Back-crossing to *N. glutinosa* produced a sesquidiploid with 2 genoms of *N. glutinosa* and 1 genom of *N. tabacum;* back-crossing to *N. tabacum* produced a sesquidiploid with 2 genoms of *N. tabacum* and 1 genom of *N. glutinosa.*

Inoculation experiments showed that in the first generation hybrids both sesquidiploids exhibited only local infection; the second generation from the sesquidiploid with 2 genoms of *N. tabacum* segregated in the number of chromosomes and in resistance to mosaic, the majority of the plants showing general infection; in the third generation from the sesquidiploid with 2 genoms of *N. tabacum*, 10 out of 19 examined families were found to contain resistant plants, one of these lines showing 50 per cent. plants with local infection.

Ternovsky (M. F.). Наследственность локализации мозаики у гибридов **Nicotiana glutinosa L. × N. tabacum L.**—[Inheritance of mosaic localization in *Nicotiana glutinosa* L. × *N. tabacum* L. hybrids.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*). [*The A.I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 135, pp. 71–74, 1938. [English summary.]

Two years' study on the susceptibility of *Nicotiana glutinosa* × *N. tabacum* hybrids to mosaic [see preceding abstract] showed that the

gene which determines the localization of the virus in *N. glutinosa* resulting in the necrotic type of lesion only, is dominant in the F_1 (amphidiploid), in the sesquidiploid with 2 genoms of *N. glutinosa* and 1 genom of *N. tabacum*, and in the sesquidiploid with 1 genom of *N. glutinosa* and 2 genoms of *N. tabacum*. The back-crosses of the sesquidiploid containing 1 genom of *N. glutinosa* and 2 genoms of *N. tabacum* with *N. tabacum*, and the second generation of this sesquidiploid do not follow the Mendelian method of segregation, apparently owing to the polyploidy of the organism and the elimination of gametes and zygotes as a result of an irregular meiosis. In the F_3 generation 5 out of 29 families showed a regular monohybrid segregation and in the F_4 gave 27 constant and 56 segregating progenies; in another set of F_3 families 19 out of 26 showed a continuous segregation and this persisted in the F_4. The 33 constant progenies obtained in the F_4 and F_5 differ but slightly from the tobacco parent Dubek 44/39, have regular meiosis, possess the normal number of 48 chromosomes for tobacco, and are being further studied.

Grushevoy [Grooshevoy] (S. E.). Болезни Табака и Махорки. [Diseases of Tobacco and Indian Tobacco.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*). [*The A.I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 136, 144 pp., 41 figs., 1938.

This is a general text-book on the fungous, bacterial, virus, and physiological diseases of tobacco and Indian tobacco (*Nicotiana rustica*), the occurrence, economic importance, symptoms, control measures, and other aspects of the various diseases being discussed in some detail.

Levykh (P. M.). Методика определения зараженности почвы хламидоспорами **Thielaviopsis basicola (Berk.) Ferraris.** [Methods for determining the degree of soil infestation with chlamydospores of *Thielaviopsis basicola* (Berk.) Ferraris.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*). [*The A.I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 135, pp. 13–22, 1938. [English summary.]

In rearing healthy tobacco seedlings the selection of soil free from spores of *Thielaviopsis basicola* [*R.A.M.*, xvii, p. 491] is thought to be preferable to sterilization of the soil, which is not always reliably carried out. The author therefore devised a method of estimating the number of chlamydospores of *T. basicola* in soil. It was found that repeated washing and centrifuging of soil samples, artificially infected with a known number of chlamydospores separated up to 92·5 per cent. of the chlamydospores present in the sample and revealed the presence of even 10 chlamydospores per c.c. of soil. In a series of pot experiments it was shown that the presence of less than 100 chlamydospores per c.c. of artificially infected soil resulted in very little infection among the seedlings and did not reduce the amount of plants suitable for transplantation; 100 to 1,000 chlamydospores per c.c. of soil resulted in only slight infection of adult tobacco, 3,312 caused severe infection, and

5,780 induced the maximum amount, which did not further increase with an increase of chlamydospores. It is thought that the method would be quite suitable for use in practice.

GRUSHEVOY [GROOSHEVOY] (S. E.). Меры борьбы с рассадной гнилью Табачной и Махорочной рассады. [Measures for controlling damping-off of Tobacco and Indian Tobacco seedlings.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*). [*The A.I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 135, pp. 4–12, 1938. [English summary.]

Damping-off of tobacco and Indian tobacco [*Nicotiana rustica*] seedlings in all tobacco-growing districts of the U.S.S.R. is stated to be mainly caused by *Rhizoctonia* sp. (*Moniliopsis aderholdi*) [*R.A.M.*, xv, p. 61] and sometimes, especially in beds of very young seedlings, by *Pythium de Baryanum* [loc. cit.]. *M. aderholdi* [ibid., xvii, p. 183] was found in 1937 in the Azoff-Black Sea region also to attack the roots of the seedlings. Experiments in which sclerotia of *M. aderholdi* were put into the soil at different depths showed that the mycelium of this fungus was able to reach the surface of the soil from 80 per cent. of sclerotia buried at a depth of 0·5 cm., from 44·5 per cent. at a depth of 2 cm., and from none at a depth of 5 cm. Pot experiments showed, however, that the fungus was capable of causing infection of the seedlings, though in a considerably less degree, from a depth of about 10 cm. Apparently the mycelium grew upwards through the soil till it met the roots of the seedlings and, except in periods of relatively low temperatures, could then reach the stem, causing damping-off. Of all the fungicides tested in both field and laboratory trials spraying with 1 per cent. Bordeaux mixture gave the best control against both *M. aderholdi* and *P. de Baryanum*, while dusting with flowers of sulphur diluted with four parts of sand was only effective against the former. According to experimental results obtained in 1936, the application of Bordeaux mixture increased the production of Indian tobacco seedlings suitable for transplanting 2·8 times, and dusting with flowers of sulphur 2·4 times. It is concluded that complete disease control would result from filling the seed-beds with a layer of sterilized soil, at least 10 cm. thick, spraying with 1 per cent. Bordeaux mixture at the appearance of the first pair of true leaves or earlier and thereafter at 5-day intervals, destroying old sources of infection, and securing good ventilation of the seed-beds.

GRUSHEVOY [GROOSHEVOY] (S. E.) & KHUDYNA (I. P.). Оздоровление семенного материяла Табака. [Disinfection of Tobacco seed.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*). [*The A.I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 135, pp. 31–48, 1938. [English summary.]

The results of experiments described in this paper, carried out by phytopathologists of the State Institute for Tobacco from 1935 to 1937, led to the following conclusions. The longer seeds of tobacco are stored the less they are contaminated with pathogenic bacteria or fungi; this observation did not, however, apply to virus diseases, nor did the

selection of seeds from apparently healthy plants guarantee virus-free seed in all varieties of tobacco. It is, therefore, essential to disinfect the seeds against virus diseases. Heating for 30 to 60 mins. at a temperature of 85° to 95° C. reduced the percentage of white spot [believed to be caused by a virus: *R.A.M.*, x, p. 346] by nearly half. *Bacterium tabacum* in dry diseased leaves lost its virulence almost entirely when heated for one hour at 85° to 90° and entirely at 95°. Seeds were freed from *Fusarium* sp. and *Alternaria tenuis* [ibid., xvi, p. 344] when heated for one hour at 85° to 95°. Seeds which had a water content of less than 6·5 per cent. prior to heat treatment showed the least reduction of germination. It is recommended to heat the seed, after preliminary drying, either in a layer 1 cm. thick, or in small bags of 100, 200, and 500 gm. Gradual warming of the seeds was less deleterious than rapid. Heating in bags of 100 or 200 gm. at 100° or in bags of 500 gm. at 90° C. did not impair germination, neither did storing the heated seed for one year. Of the fungicides tested the formalin solution at the rate of 1 in 50 for 10 mins. freed tobacco and Indian tobacco [*Nicotiana rustica*] seeds from the causal agents of bacterial leaf spot 'ryaboukha' [chiefly *Bact. tabacum*: ibid., xv, p. 749], and the Soviet-made germisan in a 1 to 3 per cent. solution controlled *Bact. tabacum* and the seed-borne fungi *Alternaria* and *Fusarium* spp. After treatment with germisan the seeds should be thoroughly washed, well dried, and sown.

Muncie (J. H.) & Ken Knight (G.). **Tomato spraying trials.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xx, 4, pp. 247–250, 1938.

In a comparative spraying test carried out in Michigan in 1936 to ascertain to what extent materials likely to control *Septoria lycopersici* [*R.A.M.*, xvii, pp. 81, 140] depressed the yield of tomatoes as compared with Bordeaux mixture, Marglobe tomatoes sprayed four times at the rate of 300 gals. per acre per application with Bordeaux mixture (4–6–100), oxo bordo (6–100), coposil (2–100), and cuprocide (2–100, plus 4 oz. spreader) yielded, respectively, 3·64, 4·05, 5·08, and 5·08 tons per acre, as compared with 5·9 tons per acre for the unsprayed controls, the corresponding figures for the variety Pritchard being 6·07, 6·08, 7·66, and 5·57 tons, with 6·52 tons in the controls, and for the variety John Baer 4·57, 5, 5·52, and 6 tons, with 6·21 tons in the unsprayed controls. *S. lycopersici* was not seen on the control plants until 10th September and the crop was harvested between 10th August and 22nd September.

In a similar test in 1937, five applications of the same materials (4 oz. spreader used with the coposil) made to the variety Pritchard gave, respectively, yields of 21·71, 25·55, 23·45, and 24·42 tons per acre, with 28·58 tons per acre for the unsprayed controls, the corresponding figures for estimated defoliation due to infection by *S. lycopersici* and early blight [*Alternaria solani*: ibid., xvi, p. 419 *et passim*] being 25, 25, 35, and 5 per cent., with 40 per cent. in the controls.

The best protection against infection was thus given by the cuprocide plus spreader, but the fungicidal value of the new sprays under conditions of severe infection remains as yet unknown, and for the present growers are advised to continue spraying with Bordeaux mixture.

Crandall (B. S.) & Hartley (C.). **Phytophthora cactorum associated with seedling diseases in forest nurseries.**—*Phytopathology*, xxviii, 5, pp. 358–360, 1938.

Phytophthora cactorum [*R.A.M.*, xvii, p. 584, and above, p. 681] appears from observations by the writers and others in the United States to be the cause, not only of damping-off of conifers, but also of die-back and canker of various broad-leaved trees. In unpublished communications to the authors, C. May reports the isolation of the fungus from European beech seedlings showing top wilt symptoms in Ohio, and R. Swingle its occurrence on tulip poplar [*Liriodendron tulipifera*] seedlings with typical sore shin in the same State. Walnut (*Juglans nigra*) seedlings in a North Carolina nursery developed a sudden destructive wilt, which was shown by cultural studies and inoculation experiments to be due to *P. cactorum*. The same organism was further found to be responsible for a disease involving softening of the leaves and upper stems of *Nyssa sylvatica*, *Colutea arborescens*, and *Caragana arborescens* seedlings in a Missouri nursery, causing estimated losses of 80, 25, and 100 per cent., respectively. Similar attacks, also presumably due to *P. cactorum*, occurred on species of *Cornus*, *Robinia*, *Acer*, *Prunus*, and *Ostrya* in the same nursery. A collar rot of four-week-old seedlings in a Maryland nursery was found to be caused by *Phytophthora cactorum*, which is also a weak pathogen of *Pinus resinosa*, mostly on heavy soils under abnormally humid conditions. In comparative inoculation tests on three-year-old seedlings of this species, 15 out of 16 were killed by the so-called *Phytophthora pini* [included by Tucker under *P. cactorum*: ibid., x, p. 755] from *Pinus resinosa*, while none of the ten inoculated with *Phytophthora cactorum* from *N. sylvatica*, *Colutea arborescens*, *Caragana arborescens*, and *Pinus nigra* suffered any ill effects.

Hopp (H.). **Sporophore formation by Fomes applanatus in culture.**—*Phytopathology*, xxviii, 5, pp. 356–358, 1 fig., 1938.

A strain of *Fomes applanatus* [*Ganoderma applanatum*] isolated from the context of a sporophore on a fallen beech (*Fagus grandifolia*) [*R.A.M.*, xii, p. 544] log in New York State produced no fructifications during four years' culture on malt agar, but on transference to sterilized poplar (*Populus canadensis* var. *eugenei*) [ibid., xiii, p. 604] blocks, maintained under controlled conditions at 28° C. at varying percentages of relative humidity in special humidity chambers described elsewhere (*Bot. Gaz.*, xcviii, p. 25, 1936), 14 sporophores developed on 11 out of 30 blocks in one to three weeks. Ten of these fruit bodies were atypical in so far as they either lacked a normal pileus or did not tend in a vertical direction; the four normal ones were formed on the vertical sides of blocks exposed to 75 per cent. relative humidity and ultimately attained a length of 2 to 3 cm. This is believed to be the first record of the formation of typical *G. applanatum* sporophores in culture. Evidently the necessary environmental conditions for the process include exposure of the surface mycelium to ventilation with air of normal oxygen concentration; sufficient moisture supply to the mycelium within the substratum; and continuous but moderate desiccation of

the surface mycelium by exposure of the wood block to moist but not saturated air.

Birch (T. T. C.). **Armillaria mellea (Vahl.) Quél. in relation to New Zealand forests.**—*Rep. Aust. N.Z. Ass. Sci.*, xxiii, pp. 276–279, 1937. [Received July, 1938.]

Armillaria mellea is stated to occur in many of the indigenous forest soils in New Zealand, where it was found to be responsible for heart rot in a heavily overstocked stand of sapling silver beech (*Nothofagus menziesii*), a white pocket rot of sawn timber of the same host, and root rot of various exotic conifers [*R.A.M.*, xiii, p. 553], including *Pinus radiata*, *P. ponderosa*, *P. laricio* [*P. nigra*], *P. murrayana*, and to a slighter extent *Chamaecyparis lawsoniana*. A debilitated condition, induced either by faulty planting or an adverse environment, appeared to be a decisive predisposing factor in all the cases of *Armillaria* root rot observed.

Van Vloten (H.). **Een ziekte van den Douglasspar, (waarschijnlijk) veroorzaakt door Phaeocryptopus gaeumanni (Rohde) Pet. [Adelopus gaeumanni Rohde].** [A Douglas Fir disease (probably) caused by *Phaeocryptopus gaeumanni* (Rohde) Pet. (*Adelopus gaeumanni* Rohde).]—*Ned. Boschb.-Tijdschr.*, xi, 5, pp. 196–204, 3 figs., 1938.

A summary is given of the available knowledge concerning the Douglas fir (*Pseudotsuga douglasii* and *P. glauca*) [*P. taxifolia*] disease caused by *Phaeocryptopus gaeumanni* (Rohde) Pet. [*R.A.M.*, xvii, p. 638] in Switzerland, Germany, and Austria followed by a report of the conclusions—confirmatory of those already published by von Gaisberg and Rohde [ibid., xvii, p. 84, *et passim*]—reached by the members (Frl. v. Gaisberg, E. Munch, J. Liese, T. Rohde, and the author) of a study tour through the infected stands of south Germany from 21st to 23rd March, 1938.

Peace (T. R.). **Butt rot of conifers in Great Britain.**—*Quart. J. For.*, xxxii, 2, pp. 81–104, 1938.

A survey made in about 250 woods in Great Britain where felling or thinning of conifers was in progress or had recently taken place, showed that butt rot [*R.A.M.*, xiv, p. 803] was most prevalent on larch but was nearly as bad on spruce [*Picea abies*] and Douglas fir [*Pseudotsuga taxifolia*], whereas all the pines examined appeared to be remarkably resistant up to the ages of 60 or 70 years, and silver fir [*Abies alba*] to be even less affected. The evidence suggested that *Thuja plicata* is likely to suffer considerably, and that *T. heterophylla* and Lawson's cypress [*Cupressus lawsoniana*] are certainly more susceptible than pines.

By far the most important causal agent was *Fomes annosus* [ibid., xvii, p. 361], which was responsible for the rot on 2,534 out of 3,195 affected trees examined; it occurred on most of the species under observation, and nearly as often on young trees as on old ones. *Polyporus schweinitzii* [ibid., xvii, p. 359] was the second most frequent cause of butt rot, being found on 58 trees (larch, Norway spruce, Sitka spruce [*Picea sitchensis*], Scots pine [*Pinus sylvestris*], and Douglas

fir); it is a rot of middle age and maturity, attacking chiefly trees 50 years old or more. *Armillaria mellea* was observed on 42 trees, representing a wide range of species. *Merulius himantioides* [ibid., viii, p. 280] was associated with a dark brown cubical rot of 17 European larch trees in two localities. *Hypholoma fasciculare* [ibid., xvi, p. 75] occurred on 9 trees of European larch, an unidentified larch, Sitka spruce, and *T. plicata*, generally causing a soft brown rot. Other fungi found included *Clitocybe* sp. on European larch, *Polyporus destructor* [ibid., xvi, p. 221] causing a cubical orange brown rot in European larch, *Lenzites sepiaria* [ibid., xvii, pp. 4, 215] causing a soft brown rot in Scots pine, *Stereum sanguinolentum* [ibid., xvii, p. 362] causing staining and a soft brown or streaked rot in European larch, *Coniophora cerebella* [*C. puteana*: ibid., xvii, pp. 424, 496, 640] causing a dark brown cubical rot in European larch, *C.* sp. on Norway spruce, a species of *Polyporus* or *Poria* on Scots pine, *Stereum* sp. on European larch and Norway spruce, *C. bourdotii* on Douglas fir, *F. igniarius* [var.] *robustus* causing red staining in Japanese larch [*Larix leptolepis*], and *Pholiota squarrosa* [ibid., xvi, p. 822] producing a soft brown rot in Norway spruce.

Rot was particularly heavy on land previously ploughed and sometimes on land that had carried a forest crop before, but was not present to any large extent on lands that had previously been moor or pasture. Larch was most affected at low altitudes. There was evidence that in all conifers an eastern aspect reduces rot. In spruce, rot was most prevalent on clay and least on sandy soils, while with larch the reverse obtained. Larch was very seriously affected in badly drained localities, but spruce showed less rot in badly drained than in well drained situations. In larch, the greatest amount of rot was found in areas where the rainfall was low. Spruce and some other conifers showed more rot when planted with hardwoods than when planted with other conifers or alone.

Control (in so far as it is practicable) consists in the careful selection of suitable species in areas known to be liable to rot. Once a crop has been planted, the amount of rot present in the thinnings should be noted, in order that the crop can be realized before becoming unsaleable.

EDSON (H. A.). **United States of America: bark canker of Monterey Cypress.**—*Int. Bull. Pl. Prot.*, xii, 5, p. 98, 1938.

A new destructive disease of the Monterey cypress (*Cupressus macrocarpa*) termed cypress bark canker, attributed to the fungus *Coryneum cardinalis* Wagener by W. W. Wagener [*R.A.M.*, vii, p. 754], is reported to have spread over two-thirds of California, though it has not yet appeared in the only two existing natural stands of this tree on Point Lobos and Cypress Point on the Monterey Peninsula, within a few miles of severely infected windbreak and ornamental plantings. It has also been found in a less virulent form on introduced Italian cypress [*C. sempervirens*]. According to experimental tests other related conifers may be susceptible to the disease, although so far no infection has been observed in the open. Every attempt is being made to check the spread of the disease.

RICHARDS (AUDREY C.). **Defects in cross ties, caused by fungi.**—*Cross Tie Bull.*, xix, 3, pp. 1–31, 17 figs., 1938.

This is a semi-popular summary of the information at present available on the fungal rots of railway sleepers in the United States [*R.A.M.*, xvii, p. 4 *et passim*] based largely on the writer's extensive experience in the examination of decayed material at the Forest Products Research Laboratory, Madison, Wisconsin.

Ascu—a wood preservative.—*Indian For. Rec.*, N.S., *Utilization*, i, 6, pp. 143–187, 1 pl., 4 diags., 1938.

A detailed account, preceded by a foreword by H. Trotter, Utilization Officer at the Forest Research Institute, Dehra Dun, is given of experiments in India on the ascu process of timber preservation, with full directions for the application of this very promising form of treatment [*R.A.M.*, xvii, p. 278].

OGILVIE (L.) & HICKMAN (C. J.). **Progress report on vegetable diseases. IX.**—*Rep. agric. hort. Res. Sta. Bristol, 1937*, pp. 96–109, [1938].

Asparagus rust [*Puccinia asparagi*: *R.A.M.*, xiii, p. 212; xvii, p. 581], last reported near Evesham in 1933, occurred to a slight extent in nearly every field of this crop in the Vale of Evesham in 1937, favoured, apparently, by hot, dry weather with heavy dews in August and September. Control consists in an early, thorough cutting and burning of the bower, with thorough cutting of the buds in spring. When maiden plants are attacked, as at Evesham, the seedling-beds should be isolated from the main plantings. The latter should be in moderately exposed situations, not bounded by hedges or trees, and with the rows parallel to the direction of the wind.

Halo blight (*Bacterium medicaginis* var. *phaseolicola*) [ibid., xvii, pp. 578, 585] incidence on dwarf beans [*Phaseolus vulgaris*] ranged from 0 to 13 per cent. on the pods of 67 varieties tested, this figure not being closely correlated with the number of plants infected. The valuable early variety, Prince, was resistant [ibid., xvi, p. 85], as was Peerless. Varietal susceptibility and resistance may frequently be estimated from the seed colour alone. The comparative resistance of the Abundant, Black Prince, Black Wonder, Ne Plus Ultra, Superlative, and Unrivalled varieties was confirmed. Pod infection by mosaic [ibid., xvii, p. 369] amounted to over 30 per cent. Varieties with dark green foliage were less affected by leaf symptoms than others. Seed of the variety William's Earliest of All was heavily infected with mosaic and gave 44 and 94 per cent. infection on 20th July and 18th August, respectively. Locally, the disease appears to be chiefly due to common bean mosaic (*Phaseolus* virus 1) [see above, p. 646]. The symptoms are severe leaf-mottling and blistering, with downward curling of the edges; the plants and leaves may be small, and the pods are distorted, rough, and sometimes warted. The Princess and Hundred for One bean varieties again remained free from anthracnose (*Colletotrichum lindemuthianum*) [ibid., xvii, p. 574], the following also being unaffected: Selected Canadian Wonder (Sutton), Foremost, Magpie, Leicester Wonder, Abundance, and Emperor William.

The Passion group of winter lettuces showed marked winter hardiness

and resistance to *Botrytis* [*cinerea*: ibid., xvii, p. 6], while the subgroup, Stanstead Park, averaged 71 and 52 per cent. survival in two tests, respectively.

Onion white rot (*Sclerotium cepivorum*) [ibid., xiii, p. 614] is widely distributed in the Bristol province, mainly on White Lisbon spring onions. It is occasionally epidemic, and in 1937 destroyed whole fields of this variety, though in one case onions had not been planted for eight years. A soil application in two localities of a proprietary organic mercury compound in dust form, stated to contain hydroxymercurichlorophenol with 20 per cent. organically combined mercury, before sowing White Lisbon onions, and made at the rate of 1 oz. per sq. yd. of soil surface, gave 56·8 and 17·9 per cent. infection for the two localities, respectively, as against averages of 86·7 and 90·4 per cent. for the corresponding untreated control plots (four in each area).

KLEMM (M.). **Die wichtigsten Krankheiten und Schädlinge an Raps und Rübsen.** [The most important diseases and pests of Colza and Rape.]—*Dtsch. landw. Pr.*, lxv, 19, p. 239; 20, pp. 251–252, 9 figs., 1 map, 1938.

Semi-popular notes are given on the following diseases contributing to the reduction of the colza [*Brassica napus*] and rape [*B. rapa oleifera*] yields in Germany; root rot (*Pythium de Baryanum* and other soil-inhabiting fungi), club root (*Plasmodiophora brassicae*) [*R.A.M.*, xvi, p. 509], black rot (*Pseudomonas campestris*), mosaic [ibid., xvi, p. 10], canker (*Sclerotinia sclerotiorum*) and a destructive black spotting of the stems, petioles, and siliquae due to *Alternaria brassicae*, which was responsible for losses amounting to 75 per cent. of the crop in eastern Schleswig-Holstein in 1935 and caused appreciable damage elsewhere. White rust (*Cystopus candidus*) [ibid., xiv, p. 2], downy mildew (*Peronospora parasitica*) [ibid., xiv, p. 1], and true mildew (*Erysiphe communis*) are of less frequent occurrence and have not so far caused substantial injury.

HARTMAN (J. D.). **Boron deficiency of Cauliflower and Spinach on Long Island.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 518–525, 4 figs., 1938.

In further investigations into cauliflower browning in New York State [*R.A.M.*, xvi, p. 722; xvii, p. 496] two crops of Improved Holland Erfurt cauliflowers and two of Reselected Savoy spinach were grown in the greenhouse in boxes of surface soil from an affected cauliflower field on Long Island. Before planting each crop of cauliflower and the second crop of spinach, borax was added to three boxes in amounts of 0·1, 1·6, and 0·08 gm., respectively; ample quantities of fertilizers were supplied to all plants. In the first cauliflower experiment only two heads showed external browning of the type always accompanied by internal brown spotting, but in the second experiment all the heads in the boxes without borax showed the condition, one head developing mild hollow stem. No symptoms appeared in the borax-treated boxes. The spinach plants grown without boron, especially those of the second crop, had small, deformed leaves, and many of the plants turned yellow and died, whereas most of the plants supplied with borax grew normally.

In a field test with two rows of Danamerica and two of Improved Holland Erfurt cauliflowers, one row of each receiving about 5 lb. borax per acre, the borax application significantly reduced the amount of internal brown spotting in all cases except that of the Danamerica variety at P_H 6 to 7·1. The rate of application appeared to be too low to eliminate the condition completely. Injury from boron deficiency was more severe in soils at P_H 4·7 to 5 than at P_H 6 to 7·1. In a further experiment, a borax application of 25 lb. per acre eliminated hollow stem almost completely from Improved Holland Erfurt plants, but had little effect on yield.

It is concluded that boron is apparently deficient in a number of soils on Long Island, but not sufficiently so to cause appreciable injury to cauliflowers every year, regardless of soil and weather conditions. The chief symptom of boron deficiency in cauliflowers is internal brown spotting with or without surface discoloration of the head, and hollow stem.

RALEIGH (G. J.) & RAYMOND (C. B.). **A preliminary note on the control of internal breakdown in table Beets by the use of boron.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 526–529, 1938.

For several years table beets grown in Ontario County, New York, have been affected by a physiological breakdown, known as 'girdle', characterized by dark, sunken spots which may partially encircle the beets usually at or slightly below soil-level. The trouble, which does not resemble closely the common crown rot and dry rot of sugar beets and of mangolds, has usually been attributed to drought, and generally occurs in fields where no effort has been made to maintain the organic matter content of the soil.

In pot tests in the greenhouse beet seeds were grown in soil from a severely affected field, given 5–10–5 fertilizer and various minor elements (one pot excepted). Half the pots in each treatment were watered normally (wet series) and half, after 18th May, were allowed to become dry before being watered (dry series). The results obtained showed that the borax treatment gave the best result [*R.A.M.*, xvii, p. 574] with 64 and 46 per cent. breakdown for the dry and wet treatments, respectively, as against 91 to 82 per cent. for the control; the affected plants in the borax-treated series, moreover, were but slightly injured. In a test in the spring of 1937, applications of borax at the rate of 5 lb. per acre made to a field in some parts of which injury was severe, gave 94 per cent. beets free from injury, 3 per cent. with slight internal injury, and 3 per cent. severe breakdown, the corresponding figures for two control areas being 4, 10, and 86, and 20, 30, and 50, respectively. Applications of manganese, ferrous copper, or zinc sulphates were ineffective.

OWEN (F. V.) et al. **Curly-top resistant varieties.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, pp. 91–94, 1938. [Abs. in *Facts ab. Sug.*, xxxiii, 8, p. 35, 1938.

Sugar beet-growing districts of the United States subject to curly top [*R.A.M.*, xvii, p. 497] are likely to depend on seed from the U.S. varieties 33 and 12 for the next two years or longer. Of the two, the

former gives higher sugar yields and is probably generally superior where the disease is not a serious factor, but 12 is more resistant to curly top and its production is usually reasonably good. In a test at Buhl, Idaho, five new strains (temporarily designated 610, 611, 612, 622, and 623) proved highly resistant to curly top, being roughly comparable to 12 in this respect.

NAGEL (C. M.). **The longevity of Cercospora beticola in soil.**—*Phytopathology*, xxviii, 5, pp. 342–350, 1938.

In addition to information already presented [*R.A.M.*, xv, p. 550] in connexion with studies on the relationship of soil infestation by *Cercospora beticola* [see above, p. 656] to the initiation of beet leaf-spot epidemics in Iowa, the author found that the fungus maintains its viability and pathogenicity in sterile soil cultures for 27 months and, throughout a temperature range of —27·8° to 15·5° C. In naturally infected field soil it remained pathogenic to beet for at least 20 months, but the amount of inoculum was much diminished. No correlation could be detected between the hydrogen-ion concentration of the soil and the extent of mycelial development in these experiments, but an abundance of organic matter was found to favour the growth of the fungus. Sugar beets grown a second year on a field severely infected with *C. beticola* in the preceding season contracted leaf spot in a destructive form, whereas relatively little infection occurred on adjacent land not used for beet cultivation for several seasons previous to the tests. The sucrose percentages and acre yields of the former crop (9·6 per cent. and 13·9 tons) were markedly depressed as compared with those of the latter (12·2 per cent. and 23·9 tons).

DOERELL (E. G.). **'The minor elements'—die Spurenelemente und ihre Bedeutung für das Pflanzenleben.** [The minor elements and their significance in plant life.]—*Z. Zuckerindustr. čsl. Repub.*, lxii, 31, pp. 246–247, 1938.

In connexion with a semi-theoretical discussion of the significance of the minor elements in plant growth, with special reference to boron [*R.A.M.*, xvii, pp. 195, 343, 477 *et passim*], the writer briefly summarizes some recent information on the use of this substance for the control of heart and dry rot of sugar beets in Czechoslovakia and Germany [ibid., xv, p. 338; xvii, p. 574]. That the water-soluble borates are particularly well adapted for this purpose is beyond a doubt, while there is also no question that the most efficacious rate of application is 13 to 20 kg. borax per hect., corresponding to 10 to 13 kg. boric acid. Superphosphate has proved specially valuable both as a distributor and in the provision of nutrient material, since its free phosphoric acid content affords a guarantee of solubility of the borates or boracites. In 1937 the German Reich Food Board, according to a report by C. Krügel *et al.* in Tagung der Landwirtschaftschemie, Frankfurt, 1937, authorized the manufacture of 20,000 tons of bor-superphosphate, allowing only 5 parts of borax by weight to 95 of 18 per cent. superphosphate. The borax admixture was leached out of the soil to an average extent of 78 per cent., so that no damage to succeeding crops from excessive accumulations of boron need be apprehended.

LEACH (L. D.). **Effect of downy mildew on Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, pp. 64–66, 1938. [Abs. in *Facts ab. Sug.*, xxxiii, 7, pp. 53, 1938.]

Downy mildew [*Peronospora schachtii*] has long been recognized as a serious disease of sugar beets [*R.A.M.*, xv, p. 373; xvii, p. 365] in California, causing a reduction of 30 to 40 per cent. in sucrose production. Observations in 1937 showed that in cases of early infection the beets attain only half their normal size and the sugar yield is substantially diminished. A pronounced degree of resistance has been shown by the Hartmann and Eagle Hill varieties.

SARDIÑA (J. R.). **La 'grasa' de las Judías (debida a Bacterium medicaginis var. phaseolicola) en España.** [The 'grease spot' disease of French beans (caused by *Bacterium medicaginis* var. *phaseolicola*) in Spain.]—*Bol. Pat. veg. Ent. agric., Madr.*, viii, pp. 231–264, 12 figs., 1938. [German and English summaries.]

The author states that numerous isolations from diseased French bean [*Phaseolus vulgaris*] material sent in since 1933 from the more important bean-producing centres in the provinces of Burgos, Leon, and Huesca in Spain, invariably yielded an organism which inoculation and bacteriological studies proved to be *Bacterium medicaginis* var. *phaseolicola* [see above, p. 716]. Hitherto the disease in Spain is stated to have been ascribed to *Bact. phaseoli* [ibid., xv, p. 765] on the basis of E. F. Smith's determination in 1897 (*Bot. Gaz.*, xxiv, p. 192). The author suggests the retention of the common name 'grasa' [grease] for the disease. A full description is given of the morphological and biological characteristics of *Bact. medicaginis* var. *phaseolicola*, with a few recommendations for its control.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, x, 4, pp. 71–90, 1938.

ESTONIA. The regulations governing the organization of the plant protection service in Estonia are laid down in an Order of 12th February, 1938, taking effect as from 1st April, 1938, with the exception of the clauses relating to nursery fruit trees, which come into force on 1st April, 1939. The pathogens against which the provisions are directed fall into two categories, one comprising dangerous foreign parasites not yet known to occur in the country and the other consisting of indigenous organisms attacking nursery trees. To the former group belong potato wart (*Synchytrium endobioticum*), Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*), Douglas fir [*Pseudotsuga taxifolia*] needle-fall (*Rhabdocline pseudotsugae*), and the downy and true mildews of the vine (*Plasmopara viticola* and *Uncinula necator*, respectively).

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xii, 5, p. 104, 1938.

MEXICO. The Sigatoka disease of bananas (*Cercospora musae*) [*R.A.M.*, xvii, p. 610] is reported to have invaded the principal banana-growing areas of Mexico, viz., Tabasco State and the regions of Socomusco and Mapastepec of Chiapas State. A regulation approved on 11th December, 1937 specifies the control measures to be taken against this disease.